Orthogonal Polynomials
and
Special Functions

SIAM Activity Group on Orthogonal Polynomials and Special Functions

★ ★ ★ ★   Newsletter   ★ ★ ★ ★

Contents

From the Editors

The summer ended and we are back again. We hope that this time has been fruitful in contacts and work in the different congresses held.

As we already mentioned in the most recent issue we will end our editorial activities started in June 1998, so we kindly invite candidates, with new ideas, for this position, so if you are interested in being editor of the newsletter, please contact us or Dan Lozier.

We mention also that SIAM has accepted the report of the nominating committee for the upcoming election of officers of our Group, for the period January 1, 2002 to December 31, 2004. The candidates are as follows:

Chair	Daniel Lozier, National Institute of Standards and Technology
Vice Chair	Charles Dunkl, University of Virginia
	Walter Van Assche, Katholieke Universiteit Leuven
Secretary	Peter Clarkson, University of Kent at Canterbury
	Peter McCoy, US Naval Academy
Program Director	Francisco (Paco) Marcellán, Universidad Carlos III de Madrid

Candidates have been invited to submit biographies and statements and SIAM will shortly send ballots to the members of the Activity Group.

Finally, let us thank all the contributors to the present issue. As usual we hope you enjoy the Newsletter and find interesting and useful information.

October 15, 2001

Renato Álvarez-Nodarse
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Reports from Meetings and Conferences

1. 2001: A mathematics Odyssey. A conference on the Analytic Theory of Continued Fractions, Orthogonal Functions and Related Topics, Grand Junction, Colorado (USA), August 6-10, 2001 (in honor of Bill Jones)

This year Bill Jones of the University of Colorado (Boulder, CO) reached the respectable age of 70, and since this is not a particularly interesting number, Phil Gustafson and Cathy Bonan-Hamada decided to organize a conference to make 70 a special number for Bill. Mesa State College at Grand Junction, Colorado, was the place to be during the week of August 6–10 and 28 participants (and friends of Bill) showed up to sing Happy Birthday in various languages: Norwegian, (Brazilian) Portuguese, (Flemish) Dutch, and (American) English. There were plenary lectures by Annie Cuyt on *Recent applications of rational approximation theory*, Lisa Lorentzen on *The computation of continued fractions*, Olav Njåstad on *Continued fractions associated with rational moment problems*, myself on *The Riemann-Hilbert approach for relativistic Hermite polynomials*, and Haakon Waadeland who gave a nice overview of his long relationship with Bill Jones. Several other participants gave talks on topics that Bill Jones has worked on: of course this includes continued fractions, but also Padé approximation, orthogonal and Laurent orthogonal polynomials, a great deal of frequency analysis (how can we use orthogonal polynomials on the unit circle to find frequencies in a signal?), computation of special functions, and various applications. For the latter we were fortunate to have as a participant David Field, who is a former student of Bill Jones, now working for General Motors. The conference even made the newspaper: The Denver Post of August 10, 2001 has an article **Math magicians boost mind-numbering skills**, with a picture of Haakon Waadeland and Annie Cuyt and a well-written report. A short quote from the report is: *Heads nod knowingly. Eyes light up at the strings of Greek symbols on the overhead projector. This may be an international conference dedicated to the analytic theory of continued fractions, orthogonal functions, rational approximation and related topics, but to the two dozen people in this room who have been drawn to Mesa State from around the world this week, there is only one word to describe it all. Fun.*

And fun it was. We enjoyed listening to the talks, discussing some past, present and future research, and making plans for a new collaboration. Of course we also enjoyed the excursion (some to Colorado National Monument, others to Grand Mesa) and the sturdiest among us (including Bill and his wife Martha) even went on a white water raft trip on the Colorado river. Many thanks to Phil and Cathy for having this wonderful idea of a conference and for the smooth organization.

Walter Van Assche
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2. Sixth International Symposium on Orthogonal Polynomials, Special Functions and Applications. Rome (Italy), June 18- 22, 2001

The Sixth International Symposium on Orthogonal Polynomials, Special Functions and Applications (OPSFA)

took place at Ostia, near Roma, Italy from 18 to 22 June, 2001. Here are the reports on the symposium from Tom Koornwinder, Bill Connett and Peter Clarkson.

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This recent conference was the sixth (or by a different counting the ninth) in a series of European meetings which started in Bar-Le-Duc, France, 1984. The regular participants of these conferences are like relatives from a large family, spread over Europe (or even the world), which come together every two or three years for a joyful reunion. Serious family matters certainly have to be discussed, but enough time should remain available for lighter talk, for good eating and drinking and for having a lot of fun. The cousins from Southern Europe, who are also most numerous, have in particular excelled during this long period in being hosts to their family.

The site of the 2001 meeting was Rome, or rather Lido di Ostia, which is Rome on the sea. Ostia is certainly less exciting than Rome (a good thing for keeping participants at the lectures), but Rome is still close enough (a 30 minute train ride for only 1500 Lire) to make evening visits to the city by participants or daytime visits by accompanying persons a good option. Everything, lectures, meals and accommodation, took place in an excellent and pleasant hotel in the middle of a large neighbourhood packed with modern apartment buildings of moderate height. Town planners have given this neighbourhood a human aspect by spreading shops (including many bars) all over the neighbourhood instead of concentrating them in a shopping mall. The seaside was within 10 minutes walking distance.

Those who were in, or passed through, Rome on the Sunday afternoon and evening before the meeting, could give testimony of some one million people in the streets celebrating the Italian championship of their local soccer team Roma, after a decisive match against Parma held in the city that afternoon. No hooligans here, no riots, no plundering, but young men with their girl friends, and fathers and mothers with their children all happy together about the success of their favourite club for which they had to wait so many years. (Later I read in a Dutch newspaper that there were still some disturbances and casualties.)

The conference had two plenary lectures every morning. Afterwards, at least on a generic day, there were 7 contributed lectures in four parallel sessions. The plenary lectures lasted 60 minutes including discussion, the contributed lectures 30 minutes including discussion and possible change of room. The plenary lectures were the following:

- A. Laforgia, M. Muldoon and P.D. Siafarikas, Commemoration of Á. Elbert

- R. Askey, Solutions of some q-difference equations

- C. Dunkl, Special functions and generating functions associated with reflection groups

- D. Sattinger, Multipeakons and the classical moment problem

- D. Stanton, Orthogonal polynomials and identities of Rogers-Ramanujan type

- S.K. Suslov, On Askey's conjecture

- N.M. Temme, Large parameter cases of the Gauss hypergeometric function, in particular in connection with orthogonal polynomials

- W. Van Assche, Multiple orthogonal polynomials

Speakers in all these lectures gave excellent presentations. In the commemoration of A. Elbert the three speakers gave a very worthy and impressive account of this Hungarian mathematician as a person and as a scientist. As one of the speakers said and made evident, his work was underestimated by the mathematical community. I am regretting now that I have never been in personal contact with this interesting mathematician, who died much too young.

While all plenary lectures were very interesting for me, I was in particular impressed by the lectures by Sattinger and by Van Assche. David Sattinger, coming from nonlinear pde's and integrable systems, talked about a surprising application of the classical Stieltjes moment problem and the related continued fraction expansion to peakon and antipeakon solutions of the Camassa-Holm equation. The Camassa-Holm equation is a nonlinear pde refining the KdV equation, more suitable for modelling fluid flows in thin domains. It supports solutions, so-called peakons, that are continuous but only piecewise analytic. Solutions with the peak downwards are called antipeakons. During a peakon-antipeakon collision the slope becomes infinite. Closed form of peakon-antipeakon solutions, asymptotic behaviour and scattering shift can be obtained from the continued fraction expansion and the corresponding orthogonal polynomials. A good reference is R. Beals, D.H. Sattinger and J. Szmigielski, Multipeakons and the classical moment problem, Advances in Math. 154 (2000), 229-257.

Walter Van Assche talked about multiple orthogonal polynomials. This notion has its roots in the nineteenth century, from simultaneous rational approximation, in particular Hermite-Pade approximation. The theory of multiple orthogonal polynomials came up in the Eastern European literature during the past ten or twenty years. Recently it has got a further impulse by work of Van Assche and his collaborators. These polynomials occur in

two variants, type I and type II. Type II means for instance that a polynomial $P(x)$ of degree $n_1 + n_2 + \ldots + n_r$ is orthogonal to all polynomials of degree less than n_j with respect to an weight function $\omega_j(x)$ on an interval $\Delta_j (j = 1, \ldots, r)$. One can define multiple analogues of the classical orthogonal polynomials. In a remarkable result of Van Assche, Geronimo and Kuijlaars the Fokas-Its-Kitaev Riemann-Hilbert problem associated with a system of orthogonal polynomials has a generalization to the multiple case. See "Riemann-Hilbert problems for multiple orthogonal polynomials", to appear in "Special functions 2000: Current perspectives and future directions", Kluwer, 2001; also downloadable from W. Van Assche's homepage.

The contributed talks were of great variety, such that something could be found to everybody's taste. Two contributed lectures struck me as having deserved more emphasis by the organizers and a larger time slot. In a brilliant 25-minute lecture Peter Clarkson gave a survey of properties of the Painlevé equations, restricting to Painlevé II for the sake of exposition. The Painlevé equations may be seen as nonlinear analogues of the classical special functions. Peter Clarkson is writing the chapter on Painlevé equations in the forthcoming NIST Digital Library of Mathematical Functions (successor to the Handbook of Mathematical Functions by Abramowitz and Stegun). Dan Lozier, managing editor of this DLMF project, gave a very informative contributed lecture about the present status of this large-scale enterprise, which will be of enormous importance for the future of special functions usage.

A very remarkable social event was Music for Friends on Tuesday evening, where Gino Palumbo of Universita Roma Tre, one of the conference organizers, played piano works, partly joint with Enrico Tronci, composed by himself during the years 1977-1987.

The organizers did a great job. Still a few critical remarks may be in order.

- The opening session was scheduled to last for one hour, but it was finished after 15 minutes. I would have enjoyed to hear more from the mouths of local rectors, deans and chairmen about the history of the three Roman universities, about the number of mathematics students, about the reason why most mathematics students in Italy are female, but most mathematics professors are male, and whether the Museo della Matematica housed in the Dipartimento di Matematica of Universita di Roma "la Sapienza", and mentioned in the very comprehensive booklet Tesori di Roma, is meant as something serious or as a kind of joke.

- The topics of lectures (more so for the contributed than for the invited lectures) remained somewhat classical and traditional, with emphasis on one-variable

theory and analytic methods. Some more follow-up of fascinating developments about which one could hear last year in Tempe, Arizona and some more spin-off of things going on during last half year at the Newton Institute in Cambridge, UK about symmetric functions and Macdonald polynomials might have been appropriate.

- A generic criticism of common practice in math meetings is that transparencies are displayed too briefly, so that it is impossible to take notes and to digest their full contents. During the plenary lectures this effect might have been softened by bringing in a second projector. At some meetings photocopies of transparencies of plenary lectures are distributed. A cheaper alternative might be to scan the transparencies and put them on the web or hotel TV system. Next porno flashes on the TV's in the hotel rooms might be replaced by flashes from the transparencies of the plenary lectures. After paying 20000 Lire one might then get the full view of the lecture contents on one's TV screen.

- One more thing about the web. It would have been nice if the full schedule would have been on the web some days before the beginning of the meeting.

Tom Koornwinder
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Like a visitor to ancient Herculaneum in 79 A.D., who had come to town for the very good theater, your reporter arrived in Rome on the eve of the climactic game of the Italian Soccer cup completely unaware of the real drama that was about to unfold, thinking only of polynomials, and the opportunity to visit a few historical monuments (where is the Forum anyway?) and to pay the proper obeisance to a number of Christian monuments, St. John Lateran, St. Lawrence outside the walls, the Basilica of Sts. Cosmos and Damian, etc., and perhaps to recite "Ode to Melancholy" on the grave of "a Young English Poet", when like the eruption of Vesuvius, the triumph (by the score 3-1) of AS Roma over Parma late that Sunday afternoon (June 17), changed my world, and the pandemonium let loose on the streets of Rome by the hundreds of thousands of hysterical fans was the most memorable single event of the trip. I was staying in Trastevere, and I will never forget the torrent of modern charioteers cascading down the Lungotevere di Anguillara, singing, shouting, blowing trumpets, waving enormous yellow and red flags from what were actually very small motorbikes, crossing the Ponte Palatino, and pooling in the center of Rome.

Little did I realize, that the pool of people meant that the trolley lines could not run, and soon the bus lines could not run either, and my euphoria changed to the grim realization that the only way to get to the Porta San Paola,

and the train to Lido di Ostia, was to tramp, carrying my suitcase, some three miles from Monteverde to Piramide. I caught the last train, and collapsed amid a throng of very tired and somewhat inebriated supporters for the thirty minute ride out to the Hotel Satellite in Lido di Ostia.

This was quite a dramatic beginning to the Sixth International Symposium on Orthogonal Polynomials, Special Functions and Applications (OPSFA-VI). In spite of a long evening of rumpus and ruction in the streets, the some one hundred and fifty mathematicians appeared Monday morning, for the opening ceremony of a very interesting meeting. There were seven plenary lectures, ninety two more technical research seminars, and an open problem session on the last day of the meeting. The following is a very impressionistic overview of some of the highlights of the scientific meeting. One of the topics in Dick Askey's talk which opened the meeting, was the problem of finding bounds for the maximum values of the polynomials in an orthogonal family. He reminded us of the argument due to Sonine, I believe, for the Jacobi polynomials, that gives a bound for the maximum value of each polynomial in the interval of support, and suggested several ways that this argument might be generalized to other orthogonal families. I was intrigued.

The scientific committee (de Bruin, Laforgia, Marcellan, Muldoon, Ricci, and Siafarikas) are to be congratulated for their efforts to bring speakers to these meetings who have found new and interesting uses for the classical mathematics. The excellent talk of David Sattinger was a good example of this. I am still not sure what a "multipeakon" might be, but found his application of the classical moment problem to this problem in fluid dynamics a delight. In another direction, I was also intrigued by the improbable idea presented by Walter Van Assche, of considering a family of polynomials to be orthogonal with respect to two different measures. These ideas were later elaborated on by Els Coussement, and Jonathan Coussement in research seminars.

I must give the prize for innovation to Franz Peherstorfer for his very exciting talk on the distribution of the zeroes of polynomials that are orthogonal with respect to a weight supported on disjoint intervals of the real line. I have used a simple version of this problem for years as a summer project for college students, and although they (and I) have learned much from the experience, nothing I knew prepared me for the complexity of the machinery from complex variables that he employed to give a definitive resolution to this problem. Well done!

Nonlinear special functions are alive and well. The talk of Peter Clarkson did an excellent job pulling together a number of facts about the solutions to the six Painlevé equations, including the nonlinear recurrence relations (Baecklund transformations) for the solutions of

several of them. I think that there is much more to come here. I also enjoyed the seminar of Mohammed Sifi who did some very nice harmonic analysis showing that the action of a particular Dunkl operator could be considered as a multiplier that satisfied the Hörmander condition, and therefore was bounded in L^p for a range of p. Multiplier operators first got me interested in special functions, and it is nice to see new approaches to these old questions.

The physical arrangements for the meeting were excellent. The hotel was comfortable, the food quite good, and the location away from the bustle of the center of Rome, but on the Tyrrhenian Sea, was perfect for a scientific meeting. In the gathering twilight, groups of mathematicians could be seen strolling along the beach, sampling the excellent gelato and, as is there wont, filling napkins with illegible calculations.

Arrivederci, Roma!

William Connett
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The sixth International Symposium "Orthogonal Polynomials, Special Functions and Applications" (OPSFA) was held in Rome, Italy, in June 201. This was attended by about 150 scientists from around the world. The plenary lectures were given by R. Askey, C.F. Dunkl, D. Sattinger, D. Stanton, S.K. Suslov, N.M. Temme and W. van Assche. Further there was a commemoration of A. Elbert by A. Laforgia, M. Muldoon and P.D. Siafarikas. The contributed talks were given in four parallel sessions. The structure of the meeting was similar to many others that I have attended. It was extremely well organized. Locating the OPSFA meeting near to a city such as Rome is certainly an additional attraction.

On a personal note that was the first OPSFA meeting which I have attended and I enjoyed it very much (despite three hours delays for both my London-Rome and Rome-London flights and missing luggage!). I had met a number of the other participants previously at other meetings, in particular the "Symmetries and Integrability of Difference Equations" series of meetings (Esterel, Canada, 1994; Canterbury, UK, 1996; Sabaudia, Italy, 1998; Tokyo, Japan 2000). My own research field is the study of nonlinear differential equations and nonlinear difference equations, in particular exact solutions and asymptotics. Frequently we use results from "Special Functions" and "Orthogonal Polynomials", despite being linear equations in the solution of the nonlinear problems. I was pleased and encouraged that there were some talks on nonlinear problems at this meeting, including a plenary lecture by David Sattinger.

I believe that there are many mathematicians and physicists who have research interest in "Special Functions" and "Orthogonal Polynomials" though not as their main field of research. I feel that the involvement of such scientists

in the OP-SF activity group and participation in future OPSFA meetings should be strongly encouraged.

Peter Clarkson
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3. SIAG Summer School on Orthogonal Polynomials, Harmonic Analysis, Approximation and Applications, Inzell (Germany), September 17 - 21, 2001

After the first SIAG summer school 2000 in Laredo (Spain) the second one in a series of four took place from September 17th to 21th in Inzell, (Germany), a small town located south-east of Munich close to Salzburg. About 40 participants, mostly PhD students and young researchers from 7 different countries attended the meeting.

The summer school was mainly focused on orthogonal polynomials and their various applications. We had main lectures (4 hours each) by Holger Dette (Bochum, Germany), Ryszard Szwarc (Wrocław, Poland) and Yuan Xu (Eugene, Oregon, U.S.A.) and additionally 18 contributed talks. Unfortunately Kristian Seip (Trondheim, Norway) who was announced as a invited speaker too had to cancel his participation suddenly. Instead Rupert Lasser acted for him. Due to the serious problems with the transatlantic flights during that period William Connett (St. Louis, U.S.A.) was also not able to participate.

Holger Dette presented a very stimulating lecture on canonical moments and their relations to the design problems in statistics. Ryszard Szwarc gave a very interesting and detailed lecture on the problem of non-negative linearization and the connections to commutative Banach algebras. Yuan Xu introduced us to the very challenging field of orthogonal polynomials of several variables. Finally, Rupert Lasser lectured on polynomial hypergroups and their applications to stochastics.

Let me mention here only a few of the contributed talks (this is of course a very personal view). Els Coussement reported on her recent achievements about multiple orthogonal polynomials and the relations to Bessel functions of the second kind. In her talk Noemí Laín Fernández gave us an impression about the difficulties on the construction of polynomial bases on the sphere with good localization properties. Finally, I would like to mention here the very nice presentation of Andreas Ruffing on raising and lowering operators for Charlier polynomials.

As we all know the success of a meeting depends not only on the scientific program but also on the social program. On that score we were lucky to have gotten some support from the weather. Starting on Monday with a cloudy sky and rain we ended up on Wednesday (excursion day) with a nearly perfect sunny and warm day. Almost all participants went out for excursions in the nice surroundings of Inzell. However Ryszard Szwarc had to give up his plan

to go for skiing since all skiing areas within a reasonable distance were closed. We will pay more attention on those restrictions next time!

The organizers would like to thank the sponsors of the summer school the GSF National Research Center and the graduate program "Applied Algorithmic Mathematics" of the Munich University of Technology. Due to their sponsorship we were also able to offer financial support to several participants.

Last but not least the organizers wish to express their thanks to all participants for their various contributions!

Frank Filbir
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The second of 4 Summer Schools planned for the years 2000-2003 took place September 17-21, 2001 at Inzell in Bavaria, Germany close to Salzburg. The local Organizing Committee consisting of Frank Filbir (MU Lübeck), Brigitte Forster (TU München) and Rupert Lasser (GSF Neuherberg and TU München) had selected the very pleasant Hotel Chiemgauer Hof to provide some 40 participants with nice and abundant food and a good lecture hall. Approximately half of the participants were Ph.d.-students or post docs.

The program contained 4 series of lectures, each a total of 4 full hours divided in three sessions. In addition approximately 20 contributed talks were given.

Holger Dette (RU Bochum) told us about "Canonical moments, orthogonal polynomials with applications to statistics", a subject with a rather new development as it may be seen from the recent monograph by the speaker and W.J. Studden: "The theory of canonical moments with applications in statistics, probability and analysis", Wiley 1997. The canonical moments are defined for a probability measure with compact support, and since they are invariant under affine transformations of the probability, the definition is usually considered for measures on $[0, 1]$. Dette presented the formulas for measures on $[-1, 1]$ because of applications to Jacobi polynomials. In many examples the canonical moments are much simpler than the ordinary moments, and they have many statistical applications, in particular to optimal design.

Rupert Lasser had accepted with short notice to replace K. Seip, and he told us about "Applied Harmonic Analysis". He presented the main ideas of hypergroups–in the discrete setting to avoid technicalities–and constructed the Banach $*-$algebra with respect to a left invariant Haar function. He then applied the Gelfand theory in the commutative case and went as far as giving the analogues of the theorems of Bochner and Plancherel. An important example arises in connection with orthogonal polynomials having non-negative linearization coefficients like the Gegenbauer polynomials. Under still further assumptions

such a system defines a commutative hypergroup structure on $\{0, 1, \ldots\}$.

The lectures by Lasser prepared us for those of Ryszard Szwarc (Wroclaw Univ.) "Orthogonal polynomials with applications to Banach algebras". After a general introduction to the theory of orthogonal polynomials of one variable, he focused on conditions leading to non-negative linearization coefficients (called property (P)). He presented Askey's sufficient condition and his own contributions based on a maximum principle for a discrete hyperbolic partial difference equation. The exact range of parameters for the generalized Chebyshev polynomials such that property (P) holds is still not known.

The fourth series of lectures was given by Yuan Xu (Univ. of Oregon, Eugene) "Orthogonal polynomials of several variables". Earlier this year appeared the monograph by Charles Dunkl and the speaker with the same title, and a few years ago Xu presented many important general results for the several variable case of orthogonal polynomials in his *Pitman Researh Notes* vol. **312**. Xu gave his version of the three-term recurrence relation with applications to a Christoffel-Darboux formula and to common zeros of the orthonormal polynomials of total degree N. There is no agreement as to which systems of orthogonal polynomials of several variables should be called classical. Easy cases occur by just taking products of classical weights from one variable, but also various radially symmetric weights are important. Xu showed us important systems for balls and the simplex and relations between orthogonal polynomials on a ball and on the unit sphere, generalizing the classical spherical harmonics. He also introduced us to the theory of h-harmonic polynomials due to Dunkl, where h belongs to a finite group of reflections. Xu stressed several times in his lectures that the theory of orthogonal polynomials in several variables is still in its very beginning. There are certainly already many fascinating results but large unexplored areas are waiting for examination.

The participants were lucky that Xu had been already one week in Europe, when the Inzell meeting began. Otherwise he would most probably not have been able to leave the US. The disaster of September 11 prevented Bill Connett from participating.

The meeting started with some rainy days, but on Wednesday afternoon (set aside for relaxing) the weather was sunny and warm, and the participants spread out in different groups, hiking on nearby mountains, going to Salzburg or visiting Königsee, just to mention some of the many possibilities.

On behalf of the participants I wish to thank the local organizers, the team of initiaters (Branquinho, Koelink, Lasser, Marcellán and Van Assche) as well as the Sponsors: The Graduate Program "Applied Algorithmic Mathematics", Technical University of Munich and the GSF-National Research Center for Environment and Health, Neuherberg for having given us all the chance to listen to exciting mathematics.

Christian Berg
(berg@math.ku.dk)

Forthcoming Meetings and Conferences

1. Workshop on Approximation Theory. Celebrating Dany Leviatan's 60th Birthday. Tel-Aviv (Israel), February 20 - 21, 2002

The following information is taken from the WWW site:

http://www.math.tau.ac.il/~levin/ws2002.html

Organizing Committee: Nira Dyn, David Levin, Allan Pinkus (pinkus@techunix.technion.ac.il)

Topics: Abstract and Classical Approximation Theory; Orthogonal Polynomials; Wavelets; Non-linear Approximation; Ridge Functions; Shape Preserving Approximation.

Present List of International Participants: Bruce Chalmers (Riverside), Albert Cohen (Paris VII), Wolfgang Dahmen (Aachen), Ron DeVore (South Carolina), Zeev Ditzian (Edmonton), Manfred v. Golitschek (Wurzburg), Viktor Konovalov (Kiev), Giuseppe Mastroianni (Potenza), Paul Nevai (Ohio), Konstantin Oskolkov (South Carolina), Igor Shevchuk (Kiev), Jozsef Szabados (Budapest), Vladimir Temlyakov (South Carolina).

Participation is by invitation only. People interested in attending should contact one of the organizers.

Martin Muldoon
(muldoon@yorku.ca)

2. International Workshop on Orthogonal Polynomials: Orthogonal Polynomials and Approximation Theory (IWOP'02), Leganés (Madrid), June 24–27, 2002

After a two-year break we will continue with the IWOP series started in 1992 (dedicated to Sobolev orthogonal polynomials), 1994 (polynomials orthogonal in the unit circle), 1996 (orthogonal polynomials in mathematical physics) and the last one in 1998 (dedicated to numerical applications and symbolic algorithms). This time, the 2002 edition will be dedicated to the *Orthogonal Polynomials and Approximation Theory*.

The invited speakers will be J. S. Geronimo (Georgia Institute of Technology, USA), A. B. J. Kuijlaars (Katholieke University Leuven, Belgium), V. Totik (Bolyai Institute, Hungary) A. Martinez-Filkenshtein (University of Almería,

Spain), L. Jodar (University of Valencia, Spain) and P. González Vera (University of La Laguna, Spain)

The Scientific Committee is Paco Marcellán (University of Carlos III de Madrid), Jesús Dehesa (University of Granada), Antonio Durán (University of Sevilla), Guillermo López Lagomasino (University of Carlos III de Madrid) and Walter Van Assche (Katholieke University Leuven)

The Organizing Committee is Paco Marcellán (University of Carlos III de Madrid) Jorge Arvesú (University of Carlos III de Madrid) and Renato Álvarez-Nodarse (University of Sevilla)

There will be six two-hour invited lectures, and 20 research seminars (20+5 min)

Further information will appear in the official URL site of the IWOP'02

`http://merlin.us.es/~renato/iwop/`

Renato Álvarez-Nodarse
(`ran@cica.es`)

3. Patras Conference on Differential, Difference Equations and Applications. Patras (Greece), July 1–5, 2002

On July 1, 2002 an international conference on differential, difference equations and their applications (ICDDEA, in short) will be held in Patras, Greece, at the Conference and Cultural Hall of the University of Patras. The conference is dedicated to Professor Evangelos K. Ifantis, who has worked in the above mentioned areas of mathematics, on the occasion of his sixty-seventh birthday,

The main subjects of ICDDEA will include:

- Ordinary Differential Equations.

- Partial Differential Equations.

- Ordinary Difference Equations.

- Partial Difference Equations.

- Applications.

The scientific program will consist of some plenary lectures of 1 hour, some invited lectures of 30 minutes and short communications of 20 minutes. The second circular, to be distributed by the end of November 2001, will give detailed information about it.

The cost of attendance is expected to be very reasonable. The following estimates are subject to change but it is anticipated that the registration fee will be around 240 Euro. For students, under formal verification, a reduced registration fee will be applied. The registration fee, for all registered participants, will include the lunches from 1 July to 5 July, the admission to the Conference, a copy of the book of abstracts, a copy of the Proceedings, transportation between the hotels and the conference site, reception and participation in some social events (welcome dinner, official reception, a visit to the archaeological site of Delfi, etc).

To help us with the organisation of the Conference, we would appreciate it if you, already at this early stage, could indicate your potential attendance in the preliminary registration. If you are interested in participating, please fill out the preregistration form (at the web site or available from the organizers) and return it as soon as possible (by ordinary mail, fax or e-mail) and, in any case, not later than October 15, 2001 to the Conference Mailing Address:

INTERNATIONAL CONFERENCE ON DIFFERENTIAL, DIFFERENCE EQUATIONS AND THEIR APPLICATIONS
Department of Mathematics (to Prof. P. D. Siafarikas)
University of Patras
26500 Patras, Greece
Tel. - Fax: +(3) 061 997169
E-Mail: `icddea@math.upatras.gr`

The Conference will be held at the Conference and Cultural Hall of the University of Patras, located at the University Campus which is 7 km from downtown Patras and 3 km from the Rio region, where there are many hotels which the participants could choose to stay.

The Local Organizing Committee consists of: C. Kokologiannaki (Department of Mathematics, University of Patras) P. Siafarikas (Department of Mathematics, University of Patras) A. Vourdas (Department of Electrical Engineering, University of Patras)

Patras may be reached easily by car, bus and train from Athens (220 km) or directly by many daily boats from Italy (Bari, Ancona, Brindisi, Venice).

Looking forward to seeing you in Patras.

Panayiotis Siafarikas
(`panos@math.upatras.gr`)

4. SIAM50, Philadelphia (USA), July 8-12, 2002

Information received from SIAM

SIAM will celebrate its 50th birthday at "SIAM50", a special annual meeting to be held in Philadelphia, July 8-12, 2002. This meeting will survey past accomplishments, highlight today's lively areas, and attempt to look into the future of applied and computational mathematics. The meeting themes cover SIAM's interests, a partial list of which ranges

- from analysis to applications,

- from computing to control to computational science,

- from dynamics to design,

- from linear algebra to life sciences,

- from optimization to outreach.

Five outstanding researchers have agreed to give plenary talks:

1. Ingrid Daubechies (Princeton University),

2. Martin Groetschel (ZIB, Berlin),

3. Philip J. Holmes (Princeton University),

4. Cleve B. Moler (The Mathworks), and

5. George C. Papanicolaou (Stanford University).

SIAM50 will also feature twenty topical speakers covering the breadth of SIAM's interests. A novel element of SIAM50 will be five "minitutorials", invited minisymposia intended for non-experts. These sessions, chosen by a special committee, focus on applications where mathematics and computing are making substantial contributions: learning-based statistical methods in computer vision; reverse engineering gene networks; elliptic curve cryptography; discontinuous Galerkin methods for partial differential equations; and harmonic analysis in geometric modeling.

As well as a wide variety of technical sessions, SIAM50 will offer:

- the opening reception with a 50-year retrospective,

- the community lecture followed by a reception at the Franklin Institute,

- exhibits about the history and future of applied mathematics,

- an evening of professional development organized by a committee of SIAM's next generation,

- diversity day, teachers day and

- a gala banquet. (Come prepared with a toast for SIAM.)

SIAM50 will include approximately 100 minisymposia, and we welcome minisymposium proposals (due on January 16, 2002). Abstracts for contributed and poster presentations are due on February 13, 2002. Details and updates are available at the SIAM website:

http://www.siam.org/meetings/SIAM50/

The organizing Committee is

- Marsha J. Berger, Courant Institute, New York University

- Heinz Engl, Johannes Kepler Universität, Linz

- Martin Golubitsky (co-chair), University of Houston

- Walter Strauss, Brown University

- Margaret H. Wright (co-chair), Courant Institute, New York University

Renato Álvarez-Nodarse
(ran@cica.es)
Martin Muldoon
(muldoon@yorku.ca)

5. IMA 2002 Summer Program: Special Functions in the Digital Age, Institute for Mathematics and its Applications, University of Minnesota (USA), July 22-August 2, 2002.

Information taken from

http://www.ima.umn.edu/digital-age/

Description.

The IMA workshop will use the DLMF (Digital Library of Mathematical Functions) project as a foundation and discuss what more should be done, what areas are incomplete or unrepresented, what are the resulting mathematical, symbolic, numerical and web issues, applications in physics, chemistry, etc., relationships with the Bateman project, and potential for other digital libraries in other mathematical areas. The workshop is to have a very broad outlook, encompassing a wide range of subjects connected with special functions, as well as issues concerning digital libraries and the delivery of mathematics over the internet.

A major portion of this program (7 days) will be assessments of research progress and promising vistas for future research by distinguished experts in the areas of asymptotics, combinatorial functions, statistics, computer algebra, algebraic and group theoretic methods, applications to the physical sciences, orthogonal polynomials, numerical methods, zeta functions & random matrices, Painlevé functions, elliptic functions, elliptic hypergeometric functions and the Heun function group, with the aim of pointing out what is of greatest importance in the theory and applications, and what should be included in digital library projects.

The remainder of the program (3 days) will be devoted to Digital Libraries generally and, specifically, Digital Libraries and the Mathematical Sciences, including the delivery of mathematics over the Internet. It will conclude with a panel on the "Future of Mathematical Digital Libraries", with panelists from the special functions research and users

communities, as well as representatives from mathematics societies and government funding agencies.

There will be several discussion sessions to develop specific recommendations for special function topics to be included in future Digital Libraries in Mathematics. Also there will be poster sessions, and several software demonstrations (particularly of computer algebra and numerical packages for special functions), and much of the software will be available during the program for informal use by participants. This program will link with special function related sessions at the Foundations of Computational Mathematics (FoCM'02) meeting that will be hosted by the IMA, August 5–15, 2002.

The program is meant for researchers in the theory and computation of special functions (definitely including people new to the field who are looking for the most promising areas for future research), for users of special functions, and for persons interested in the delivery of mathematics over the Internet.

Walter Van Assche
(walter@wis.kuleuven.ac.be)

6. Workshop on Special Functions at FoCM'02, Foundations of Computational Mathematics conference, Minnesota (USA), 5-7 August, 2002

The next Foundations of Computational Mathematics conference will be held at University of Minnesota on 5-14 August 2002, as guests of the Institute for Mathematics and its Applications.

With plenary talks taking part in morning, afternoons during the FoCM'02 conference will be devoted to workshops. Each workshop will be three-days long, with six workshops running in parallel. The responsibility for organising, scheduling and timetabling the workshops rests with workshop organisers.

Talks in FoCM workshops are by invitation, but feel free to contact relevant workshop organisers if you wish to present a talk.

During the Conference there will be a three days (5–7 August) workshop on "Special Functions" organized by Tom Koornwinder (thk@science.uva.nl) (Amsterdam) and Adri Olde Daalhuis (adri@maths.ed.ac.uk) (Edinburgh).

For further information see the web:

http://turing.wins.uva.nl/~thk/FoCM02/

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

7. Summer school in Orthogonal Polynomials and Special Functions. Leuven (Belgium), August 12-17, 2002

From August 12-17, 2002, a summer school in Orthogonal Polynomials and Special Functions takes place at the Katholieke Universiteit Leuven, Belgium. This summer school is the third in a series after Laredo (Spain), 2000, and Inzell (Germany), September 17-21, 2001 (see http://www.gsf.de/ibb/ag1/summerschool/).

The lecturers for the Leuven summer school are:

- Wolfram Koepf (Kassel): Computer Algebra Algorithms for Orthogonal Polynomials and Special Functions.

- Arno Kuijlaars (Leuven): Riemann-Hilbert Analysis of Orthogonal Polynomials.

- Adri Olde Daalhuis (Edinburgh): Exponential Asymptotics.

- Dennis Stanton (Minnesota): TBA.

- Joris Van der Jeugt (Gent): $3n-j$ coefficients and orthogonal polynomials of hypergeometric type.

The school is organised by Walter Van Assche and Erik Koelink. More information on the 2002 Leuven summer school can be found at

http://aw.twi.tudelft.nl/~koelink/opsf2002.html

and will also be announced in the OP-SF NET and Newsletter.

Erik Koelink
(koelink@dutiaw4.twi.tudelft.nl)

8. Seventh International Symposium on Orthogonal Polynomials, Special Functions and Applications Copenhagen (Denmark), August 18-22, 2003

At the Sixth International Symposium on Orthogonal Polynomials, Special Functions and Applications (The 6th OPSFA) in Rome, June 18-22, 2001, it was discussed when and where the next meeting should take place. Teams from Holland and Denmark were both willing to host a meeting in 2003 (see the item below). It was left to those teams to find an agreement.

Such an agreement has now been reached to the effect that the Copenhagen team promises to arrange the *Seventh International Symposium on Orthogonal Polynomials, Special Functions and Applications (The 7th OPSFA)* in Copenhagen, August 18-22, 2003.

The plan is that the meeting will take place at the Department of Mathematics of the University of Copenhagen.

The conference will be a continuation of the series of International Conferences with the meetings of Sevilla (1997), Patras (1999) and Rome/Ostia (2001) as the immediate predecessors.

Information about the meeting will be made available at the homepage

`http://www.math.ku.dk/conf/opsfa2003/`

In the coming half year steps will be taken to form an international scientific committee.

The local organizing committee will be Professor Christian Berg, Ph.D. student Jacob Stordal Christiansen and Associate Professor Henrik L. Pedersen.

Christian Berg
(berg@math.ku.dk)

9. Amsterdam Special Functions conference in 2003 canceled

As mentioned earlier, see in OP-SF NET 7.6, Topic #1, the next meeting in the series Fields-Toronto (1995) - CRM-Montreal (1996) - Mount Holyoke (1998) - Hong Kong (1999) - Arizona (2000) was expected to be held in Amsterdam in 2003, and organized by the three of us. Originally the meeting was expected in 2002, but we became aware of the two meetings at IMA, Minneapolis in July-August 2002 (see the WWW pages `http://www.ima.umn.edu/digital-age/` and `http://www.damtp.cam.ac.uk/user/na/FoCM/Conferences.html`).

During the Sixth International Symposium on Orthogonal Polynomials, Special Functions and Applications, June 18–22, 2001, Ostia-Roma, which meeting is in the series ..., Sevilla, Patras, we learned that Christian Berg is willing to organize the next meeting of this series in Copenhagen, in the summer of 2003. We have discussed with Christian several plans to combine, to have separate meetings, and so on, but we have decided to cancel the Amsterdam meeting. For us, and for Christian and his co-workers, organizing a meeting in 2004 or later is not possible. Also, we expect that two meetings in the same year will be a bad decision. More details on the Copenhagen meeting are given in this issue.

Tom Koornwinder
(thk@science.uva.nl)
Erik Koelink
(koelink@dutiaw4.twi.tudelft.nl)
Nico Temme
(Nico.Temme@cwi.nl)

Future Planning

There are plans to organize a summer school on Orthogonal Polynomials and Special Functions in Portugal in July 2003 (July). (Contact person: Amilcar Branquinho). This is in the series Inzell, 2001 (OP-SF NET 8.3, Topic #3), and Leuven, 2002 (OP-SF NET 8.4, Topic #4). The coordinator of the three summer schools is Erik Koelink (koelink@dutiaw4.twi.tudelft.nl). These summer schools are part of our Activity Group's scientific program. The scientific committee consists of Erik Koelink, Rupert Lasser, Amilcar Branquinho, Paco Marcellan and Walter Van Assche.

Books and Journals

Book Announcements

1. Special Functions 2000: Current Perspective and Future Directions. Proceedings of the NATO Advanced Study Institute on Special Functions 2000, held in Tempe, Arizona, USA. Edited by Joaquin Bustoz, Mourad E.H. Ismail & Sergei K. Suslov. Kluwer Academic Publishers.

Information received from Kluwer.

NATO SCIENCE SERIES: II: Mathematics, Physics and Chemistry, Volume 30

The Advanced Study Institute brought together researchers in the main areas of special functions and applications to present recent developments in the theory, review the accomplishments of past decades, and chart directions for future research. Some of the topics covered are orthogonal polynomials and special functions in one and several variables, asymptotic, continued fractions, applications to number theory, combinatorics and mathematical physics, integrable systems, harmonic analysis and quantum groups, Painlevé classification.

Contents and Contributors

- Preface.

- Foreword.

- Bailey's transform, lemma, chains and tree; G.E. Andrews.

- Riemann-Hilbert problems for multiple orthogonal polynomials; W. Van Assche, et al.

- Flowers which we cannot yet see growing in Ramanujan's garden of hypergeometric series, elliptic functions and q's; B.C. Berndt.

- Orthogonal rational functions and continued fractions; A. Bultheel, et al.

- Orthogonal polynomials and reflection groups; C.F Dunkl.

- The bispectral problem: an overview; F.A. Grünbaum.

- The Bochner-Krall problem: some new perspectives; L. Haine.

- Lectures on q-orthogonal polynomials; M.E.H. Ismail.

- The Askey-Wilson function transform scheme; E. Koelink, J.V. Stokman.

- Arithmetic of the partition function; K. Ono.

- The associated classical orthogonal polynomials; M. Rahman.

- Special functions defined by analytic difference equations; S.N.M. Ruijsenaars.

- The factorization method, self-similar potentials and quantum algebras; V.P. Spiridonov.

- Generalized eigenvalue problem and a new family of rational functions biorthogonal on elliptic grids; V.P. Spiridonov, A.S. Zhedanov.

- Orthogonal polynomials and combinatorics; D. Stanton.

- Basic exponential functions on a q-quadratic grid; S.K. Suslov.

- Projection operator method for quantum groups; V.N. Tolstoy.

- Uniform asymptotic expansions; R. Wong.

- Exponential asymptotics; R. Wong.

- Index.

Martin Muldoon
(muldoon@yorku.ca)

2. OPSFA Patras Proceedings. Edited by P.D. Siafarikas. Journal of Computational and Applied Mathematics, Volume 133, Issue 1-2, 1 August 2001. Elsevier

The Fifth International Symposium on Orthogonal Polynomials, Special Functions and their Applications (OPSFA, for short), was held in Patras, Greece, September 20 - 24, 1999 (see OP-SF NET 7.1, Topic #8). The Symposium was dedicated to Professor Ted Chihara in honour of his many contributions to the subject of Orthogonal Polynomials. The Proceedings have now appeared as a volume of Journal of Computational and Applied Mathematics, Volume 133, Issue 1-2, 1 August 2001, edited by P.D. Siafarikas. Here is the table of contents from: http://www.elsevier.com/locate/cam

- Preface

- List of talks presented at the conference

- List of registered participants

- R. Askey, M.E.H. Ismail and W. Van Assche, Ted Chihara and his work on orthogonal polynomials

- T.S. Chihara, 45 years of orthogonal polynomials: a view from the wings

- Jesús S. Dehesa, Andrei Martínez-Finkelshtein and Jorge Sanchez-Ruiz, Quantum information entropies and orthogonal polynomials

- P. Deift, T. Kriecherbauer, K.T.-R. McLaughlin, S. Venakides and X. Zhou, A Riemann-Hilbert approach to asymptotic questions for orthogonal polynomials

- Á. Elbert, Some recent results on the zeros of Bessel functions and orthogonal polynomials

- W.N. Everitt, K.H. Kwon, L.L. Littlejohn and R. Wellman, Orthogonal polynomial solutions of linear ordinary differential equations

- Walter Gautschi, The use of rational functions in numerical quadrature

- A.B.J. Kuijlaars, Asymptotic analysis of the density of states in random matrix models associated with a slowly decaying weight

- Manuel Alfaro, Juan J. Moreno-Balcázar, Teresa E. Pérez, Miguel A. Piñar and M. Luisa Rezola, Asymptotics of Sobolev orthogonal polynomials for Hermite coherent pairs

- I. Area, E. Godoy, A. Ronveaux and A. Zarzo, Solving connection and linearization problems within the Askey scheme and its q-analogue via inversion formulas

- N.B. Backhouse, Resonant equations and special functions

- D. Barrios Rolanía, G. López Lagomasino and E.B. Saff, Asymptotics of orthogonal polynomials inside the unit circle and Szegő-Padé approximants

- L. Rebillard and A. Ronveaux, Expansion of multivariate polynomials in products of univariate orthogonal polynomials: discrete case

- Jorge Sánchez-Ruíz and Jesús S. Dehesa, Some connection and linearization problems for polynomials in and beyond the Askey scheme

- Wim Schoutens, An application in stochastics of the Laguerre-type polynomials

- L.K. Stergioulas, V.S. Vassiliadis and A. Vourdas, Optimal bases of Gaussians in a Hilbert space: applications in mathematical signal analysis

- Franciszek Hugon Szafraniec, On matrix integration of matrix polynomials

- N.M. Temme and J.L. Lopez, The Askey scheme for hypergeometric orthogonal polynomials viewed from asymptotic analysis

- P. Van Gucht and A. Bultheel, Bernstein equiconvergence and Fejér-type theorems for general rational Fourier series

- Luc Vinet, Oksana Yermolayeva and Alexei Zhedanov, A method to study the Krall and q-Krall polynomials

- A. Vourdas, Quantum systems with finite Hilbert space and Chebyshev polynomials

- A. Wüensche, Hermite and Laguerre 2D polynomials

- Martin Muldoon (editor). Open problems. Contributions from: T.S. Chihara (two), Á. Elbert and A. Laforgia, Á. Elbert, A. Laforgia and P. Siafarikas, D. K. Dimitrov, J. Gilewicz, E.K. Ifantis, A. Kuijlaars, G. López Lagomasino, W. Mlotkowski, A. Ronveaux, P.D. Siafarikas, W. Van Assche, A. Wüensche

Martin Muldoon
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3. Selected Topics in Special Functions (R.P. Agarwal, H.L. Manocha, K. Srinivasa Rao, eds.), Allied Publishers, New Delhi, 2001, vii+322 pp. (ISBN 81-7764-169-7)

The Indian Society for Special Functions and their Applications (SSFA) have asked some of their expert members to prepare a contribution for this volume of selected papers. The editors hope that the book will be a significant contribution of the Society and that it would motivate the younger generation of mathematicians. They also hope that this volume, with contributions made by a representative section of India, will have some impact on the community of mathematicians all over the world. The contributions are

- R.P. Agarwal: Recent developments in the theory of generalized hypergeometric series

- H.L. Manocha: Lie theory, q-difference calculus and q-functions

- S. Bhargava: Cubic theta functions

- A. Verma: Polybasic hypergeometric series

- K. Srinivasa Rao: Hypergeometric series and quantum theory of angular momentum

- A.K. Agarwal: Some applications of special functions in number theory and combinatorics

- M.A. Pathan: Lie theory and generalized Bessel functions

- R.Y. Denis and S.N. Singh: Generalized hypergeometric functions and continued fractions

- C. Adiga and D.D. Somashekara: Rogers-Ramanujan identities, continued fractions and their generalizations

- R.S. Pathak: Special functions and distributions

- Vivek Sahai: Euler integral transformation, its q-analogue and special functions using Lie theory and quantum theory

- P.K. Banerji: Fractional differintegrals

- R.K. Saxena: On the unification and extension of univariate and bivariate distributions associated with special functions

- C.M. Joshi: Exact asymptotic coefficients and bounds of generalized hypergeometric functions

Walter Van Assche
(Walter.VanAssche@wis.kuleuven.ac.be)

4. The Andrews Festschrift. Edited by Dominique Foata. Springer, New York, Price: $84.95. 400 pages paperback. ISBN: 3-540-41491-6, published 2001

From the Springer web site:

http://www.springer-ny.com

This book contains seventeen contributions made to George Andrews on the occasion of his sixtieth birthday, ranging from classical number theory (the theory of partitions) to classical and algebraic combinatorics. Most of the papers were read at the 42nd session of the Séminaire Lotharingien de Combinatoire that took place at Maratea, Basilicata, in August 1998. This volume contains a long

memoir on Ramanujan's Unpublished Manuscript and the Tau functions studied with a contemporary eye, together with several papers dealing with the theory of partitions. There is also a description of a maple package to deal with general q-calculus. More subjects on algebraic combinatorics are developed, especially the theory of Kostka polynomials, the ice square model, the combinatorial theory of classical numbers, a new approach to determinant calculus.

Table of Contents

Martin Muldoon
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OP-SF preprints

In this section we will include information on some recent preprints related to Orthogonal Polynomials and Special Functions that were recently posted or cross-listed to one of the subcategories of the xxx archives. See:

- http://front.math.ucdavis.edu/math.CA

- http://front.math.ucdavis.edu/math.CO

- http://front.math.ucdavis.edu/math.QA

- http://xxx.lanl.gov/archive/solv-int

——————— · · · ———————

1. math.CA/0105093
   Title: An expansion formula for the Askey-Wilson function
   Authors: Jasper V. Stokman
   Comments: 24 pages. Some remarks added in section 6 on the connection with moment problems
   Subj-class: Classical Analysis; Quantum Algebra

2. math.CA/0106142
   Authors: C. Malyshev
   Comments: 11 pages, LaTeX
   Report-no: PDMI Preprint 04/2001
   Subj-class: Classical Analysis; Mathematical Physics

3. math.CA/0107036
   Title: Spectral theory and special functions
   Authors: Erik Koelink
   Comments: Lecture notes for the SIAM Activity Group OP-SF summer school 2000, Laredo, Spain. 40 page, latex
   Subj-class: Classical Analysis

4. math.CA/0107082
   Title: On some integrals involving the Hurwitz zeta function: part 2
   Authors: Olivier R. Espinosa, Victor H. Moll
   Comments: 17 pages, AMS-LaTeX
   Subj-class: Classical Analysis; General Mathematics; Mathematical Physics

5. math.CO/0105030

   Title: A-hypergeometric systems and embedded primes

   Authors: Laura Felicia Matusevich

   Subj-class: Combinatorics; Algebraic Geometry

6. math.CO/0106025

   Title: Generalized Umemura polynomials and Hirota-Miwa equations

   Authors: Anatol N. Kirillov, Makoto Taneda

   Comments: 19 pages

   Subj-class: Combinatorics; Quantum Algebra

7. math.CO/0106123

   Title: Extended Bell and Stirling numbers from hypergeometric exponentiation

   Authors: J.-M. Sixdeniers, K.A. Penson, A.I. Solomon (University of Paris VI)

   Comments: 12 pages, Latex. Journal of Integer Sequences (in press)

   Subj-class: Combinatorics

8. math.CO/0106191

   Title: Noncommutative symmetric functions and quasi-symmetric functions with two and more parameters

   Authors: F. Hivert, A. Lascoux, J.-Y. Thibon (University of Marne-la-Vallee)

   Comments: 13 pages, LaTex

   Subj-class: Combinatorics

9. math.CO/0106213

   Title: Reflections on symmetric polynomials and arithmetic functions

   Authors: Trueman MacHenry, Geanina Tudose

   Comments: 17 pages, 2 figures

   Subj-class: Combinatorics; Number Theory

10. math.CO/0107024

    Title: Bijections behind the Ramanujan Polynomials

    Authors: William Y. C. Chen, Victor J. W. Guo

    Comments: 18 pages, 7 figures

    Subj-class: Combinatorics

11. math.CO/0107214

    Title: q-Supernomial coefficients: From riggings to ribbons

    Authors: Anne Schilling

    Comments: 19 pages, svcon2e.sty file required

    Subj-class: Combinatorics; Quantum Algebra

12. math.CO/0108043

    Title: Restricted set of patterns, continued fractions, and Chebyshev polynomials

    Authors: T. Mansour

    Comments: 9 pages

    Subj-class: Combinatorics

13. math.CO/0108121

    Title: Applications of the classical umbral calculus

    Authors: Ira M. Gessel

    Subj-class: Combinatorics; Number Theory

14. math.CO/0108193

    Title: Partial-sum analogues of the Rogers-Ramanujan identities

    Authors: S. Ole Warnaar

    Comments: 11 pages, AMS-LaTeX

    Subj-class: Combinatorics; Quantum Algebra

15. math.QA/0105002

    Title: Partial theta functions. I. Beyond the lost notebook

    Authors: S. Ole Warnaar

    Comments: 30 pages, AMS-LaTeX

    Subj-class: Quantum Algebra; Combinatorics

16. math.QA/0105061

    Title: Nonsymmetric Macdonald polynomials and Demazure characters

    Authors: Bogdan Ion

    Comments: 15 pages

    Subj-class: Quantum Algebra; Representation Theory

17. math.QA/0105117

    Title: A locally compact quantum group analogue of the normalizer of $SU(1,1)$ in $SL(2,C)$

    Authors: Erik Koelink, Johan Kustermans

    Comments: 48 pages, 1 figure

    Subj-class: Quantum Algebra; Operator Algebras

18. math.QA/0106041

    Title: On solutions of the q-hypergeometric equation with $q^N = 1$

    Authors: Yoshihiro Takeyama

    Comments: 9 pages

    Subj-class: Quantum Algebra; Classical Analysis

19. math.QA/0106187

Title: Quantum Surfaces, Special Functions, and the Tunneling Effect

Author: M. V. Karasev (Moscow)

Comments: 49 pages, Latex-file

Subj-class: Quantum Algebra

20. math.QA/0107126

Title: On the evaluation formula for Jack polynomials with prescribed symmetry

Authors: P.J. Forrester, D.S. McAnally, Y. Nikoyalevsky

Comments: 18 pages

Subj-class: Quantum Algebra

21. math.QA/0107225

Title: Duality and self-duality for dynamical quantum groups

Authors: Hjalmar Rosengren

Comments: 26 pages

Subj-class: Quantum Algebra

22. math.NT/0105003

Title: Formules pour les nombres premiers

Authors: A.Balan

Comments: In french

Subj-class: Number Theory; General Mathematics

23. math.NT/0105120

Title: Sur certains espaces de Hilbert de fonctions entieres, lies a la transformation de Fourier et aux fonctions L de Dirichlet et de Riemann

Authors: Jean-Francois Burnol

Comments: 10 pages. In french with an english summary

Subj-class: Number Theory

24. math.NT/0106054

Title: Linear independence of Gamma values in positive characteristic

Authors: W. Dale Brownawell, Matthew A. Papanikolas

Comments: 51 pages

Subj-class: Number Theory

25. math.NT/0106148

Title: New Approach to Ohno Relation for Multiple Zeta Values

Authors: Jun-ichi Okuda, Kimio Ueno

Comments: 15 pages

Subj-class: Number Theory

26. math.NT/0107043

Title: On the Divergence of the Rogers-Ramanujan Continued Fraction on the Unit Circle

Authors: Jimmy McLaughlin, Doug Bowman

Comments: 25 pages

Subj-class: Number Theory

27. math.NT/0108054

Title: On the exceptional zeros of Rankin-Selberg L-functions

Authors: Dinakar Ramakrishnan, Song Wang

Comments: 31 pages. For ps, dvi and pdf formats of the paper, see

http://www.math.caltech.edu/people/dinakar.html

Subj-class: Number Theory

28. hep-th/0105107

Title: Jack superpolynomials, superpartition ordering and determinantal formulas

Authors: P. Desrosiers, L. Lapointe, P. Mathieu

Comments: Latex 2e, 20 pages

Subj-class: High Energy Physics - Theory; Mathematical Physics;

Quantum Algebra; Exactly Solvable and Integrable Systems

29. math-ph/0105002

Title: Some introductory notes on quantum groups, quantum algebras, and their applications

Author: R. Jaganathan (The Institute of Mathematical Sciences, India)

Comments: 23 pages, LaTeX2e - To appear in the Proceedings of a Programme on Quantum Groups and their Applications held at the Ramanujan Institute for Advanced Study in Mathematics, University of Madras, India

Report-no: IMSc/2001/24

Subj-class: Mathematical Physics; Quantum Algebra

30. math-ph/0105007

Title: Hypergeometric-like Representation of the Zeta-Function of Riemann

Authors: Krzysztof Maslanka

Subj-class: Mathematical Physics

31. math-ph/0105030

Title: Elliptic and Hyperelliptic Solutions of Discrete Painlevé I and Its Extensions to Higher Order Difference Equations

Authors: Shigeki Matsutani

Comments: AMS-TeX, 9 pages

Subj-class: Mathematical Physics; Algebraic Geometry; Number Theory

32. math-ph/0105031

Title: Recursion Relation of Hyperelliptic Psi-Functions of Genus Two

Authors: Shigeki Matsutani

Comments: AMS-TeX, 10 pages

Subj-class: Mathematical Physics; Algebraic Geometry; Number Theory

33. math-ph/0105032

Title: Soliton Solutions of Korteweg-de Vries Equations and Hyperelliptic Sigma Functions

Authors: Shigeki Matsutani

Comments: AMS-TeX, 11 pages

Subj-class: Mathematical Physics; Algebraic Geometry; Analysis of PDEs

34. math-ph/0108019

Title: N-Level Quantum Systems and Legendre Functions

Authors: A. S. Mazurenko, V. A. Savva

Comments: 6 pages, latex, no figures, see also this http URL

Subj-class: Mathematical Physics

Journal-ref: Proceedings of Third Annual Seminar "Nonlinear phenomena in complex systems", Minsk: Institute of Physics, 1995, 328

35. nlin.CD/0105048

Title: Occurrence of periodic Lamé functions at bifurcations in chaotic Hamiltonian systems

Authors: M. Brack, M. Mehta, K. Tanaka

Comments: LaTeX2e, 22 pages, 14 figures. Submitted to J. Phys. A. Version 2: Replaced Tabs. 1,2 and Figs. 4-7,9,10 after correction of numerical error and obtaining improved convergence and improved results. Corrected misprint in last line of Sec.3 Subj-class: Chaotic Dynamics; Mathematical Physics

36. quant-ph/0105044

Title: Some Exact Results for Mid-Band and Zero Band-Gap States of Associated Lame Potentials

Authors: Avinash Khare, Uday Sukhatme

Comments: 18 pages, 2 figures

Report-no: UICHEP-TH/01-2, IP-BBSR/01-5, May 2001

Subj-class: Quantum Physics; Mathematical Physics

37. math.RT/0106222

Title: Superanalogs of the Calogero operators and Jack polynomials

Authors: Alexander Sergeev

Comments: Latex, 27 pages

Subj-class: Representation Theory; Mathematical Physics

38. math.RT/0107072

Title: The Strong Macdonald Conjecture

Authors: S. Fishel, I. Grojnowski, C. Teleman

Subj-class: Representation Theory; Combinatorics

39. math.RT/0108042

Title: Matrix Valued Spherical Functions Associated to the Complex Projective Plane

Authors: F. A. Grünbaum, I. Pacharoni, J. Tirao

Comments: 70 pages, 1 figure

Subj-class: Representation Theory; Classical Analysis

40. math.RT/0108185

Title: Dunkl operators for complex reflection groups

Authors: C. F. Dunkl, E. M. Opdam

Comments: 36 pages; Programme on Symmetric Functions and Macdonald

Polynomials at the Isaac Newton Institute

Subj-class: Representation Theory

41. cs.LG/0107033

Title: Yet another zeta function and learning

Authors: Igor Rivin

Subj-class: Learning; Discrete Mathematics; Probability Theory

42. nlin.SI/0108049

Title: Duality, Biorthogonal Polynomials and Multi-Matrix Models

Authors: M. Bertola, B. Eynard, J. Harnad

Comments: Latex, 44 pages, 1 table

Subj-class: Exactly Solvable and Integrable Systems; Mathematical Physics

43. nlin.SI/0107050

   Title: On the Rational Solutions of q-Painlevé V Equation

   Authors: Tetsu Masuda

   Comments: 16 pages

   Subj-class: Exactly Solvable and Integrable Systems

44. nlin.SI/0107062

   Title: Relativistic Toda chain at root of unity II. Modified Q-operator

   Authors: S. Pakuliak, S. Sergeev

   Comments: LaTeX2e, 27 pages

   Subj-class: Exactly Solvable and Integrable Systems

45. nlin.SI/0107063

   Title: Relativistic Toda chain at root of unity III. Relativistic Toda chain hierarchy

   Authors: S. Pakuliak, S. Sergeev

   Comments: LaTeX2e, 21 pages, misprints corrected

   Subj-class: Exactly Solvable and Integrable Systems

46. nlin.SI/0107074

   Title: Transformations $RS_4^2(3)$ of the Ranks ≤ 4 and Algebraic Solutions of the Sixth Painlevé Equation

   Authors: F. V. Andreev, A. V. Kitaev

   Comments: 26 pages

   Subj-class: Exactly Solvable and Integrable Systems

47. nlin.SI/0108010

   Title: Quasi-linear Stokes phenomenon for the second Painlevé transcendent

   Authors: A. R. Its (IUPUI, Indianapolis), A. A. Kapaev (PDMI, St Petersburg)

   Comments: 19 pages, LaTeX

   Subj-class: Exactly Solvable and Integrable Systems

48. nlin.SI/0108052

   Title: Asymptotics of semiclassical soliton ensembles: rigorous justification of the WKB approximation

   Authors: P. D. Miller

   Comments: Submitted to Int. Math. Res. Not

   Subj-class: Exactly Solvable and Integrable System

Problems and Solutions

Thus far 22 problems have been submitted, seven of which have been solved in previous issues. Still unsolved are Problems #**3**, **5**, **8**, **9**, **11**, **12**, **13**, **15**, **17**, **18**, **19**, **20**, **21** and **22**. This time no new problems have 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 $L^p(\mathbf{T})$, $1 \leq p \leq \infty$, i.e., for polynomial f

$$\left\| \sum m_k \hat{f}_k e^{ik\varphi} \right\|_{L^p(\mathbf{T})} \leq \|m\|_{M^p(\mathbf{T})} \left\| \sum \hat{f}_k e^{ik\varphi} \right\|_{L^p(\mathbf{T})} ,$$

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

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

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],

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

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

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

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

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

(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 $p \geq 1$.

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):

$$
\begin{aligned}
&F(p+\tfrac{1}{2}, -r-\tfrac{1}{2}, 1+p+q; z)F(-p+\tfrac{1}{2}, r+\tfrac{1}{2}; 1+q+r; 1-z) \\
&+F(p+\tfrac{1}{2}, -r+\tfrac{1}{2}, 1+p+q; z)F(-p-\tfrac{1}{2}, r+\tfrac{1}{2}; 1+q+r; 1-z) \\
&-F(p+\tfrac{1}{2}, -r+\tfrac{1}{2}, 1+p+q; z)F(-p+\tfrac{1}{2}, r+\tfrac{1}{2}; 1+q+r; 1-z) \\
&= \frac{\Gamma(p+q+1)\Gamma(q+r+1)}{\Gamma(p+q+r+\tfrac{3}{2})\Gamma(q+\tfrac{1}{2})} \qquad\qquad (**)
\end{aligned}
$$

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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21. Question on an exact solvable Schrödinger equation

What are all the Schrödinger equations that have exact solutions expressible in terms of the Kampé de Fériet function?

(Submitted on June 3, 1999)

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22. Question about Kampé de Fériet series

How to prove the following reduction identities for the Kampé de Fériet series:

$$
\mathrm{F}^{1:1;3}_{1:0;2}\left(\begin{matrix} 2 \\ 5/2 \end{matrix}\ \middle|\ \begin{matrix} 1 \\ - \end{matrix}\ \middle|\ \begin{matrix} 1,1,1 \\ 2,2 \end{matrix}\ \middle|\ x,x\right) =
$$
$$
{}_2\mathrm{F}_1\left(\begin{matrix} 1,1 \\ 3/2 \end{matrix}\ \middle|\ x\right) {}_3\mathrm{F}_2\left(\begin{matrix} 1,1,1 \\ 3/2,2 \end{matrix}\ \middle|\ x\right), \qquad (2)
$$

$$
\mathrm{F}^{2:1;3}_{2:0;2}\left(\begin{matrix} 2,2 \\ 5/2,3 \end{matrix}\ \middle|\ \begin{matrix} 1 \\ - \end{matrix}\ \middle|\ \begin{matrix} 1,1,1 \\ 2,2 \end{matrix}\ \middle|\ x,x\right) = \left[{}_3\mathrm{F}_2\left(\begin{matrix} 1,1,1 \\ 3/2,2 \end{matrix}\ \middle|\ x\right)\right]^2, \quad (3)
$$

$$
\mathrm{F}^{2:1;2}_{2:0;1}\left(\begin{matrix} 2,2 \\ 3,3 \end{matrix}\ \middle|\ \begin{matrix} 1 \\ - \end{matrix}\ \middle|\ \begin{matrix} 1,1 \\ 2 \end{matrix}\ \middle|\ 1,1\right) = 4\,{}_4\mathrm{F}_3\left(\begin{matrix} 1,1,1,1 \\ 2,2,2 \end{matrix}\ \middle|\ 1\right), \quad (4)
$$

$$
\mathrm{F}^{3:1;2}_{3:0;1}\left(\begin{matrix} 2,2,2 \\ 3,3,3 \end{matrix}\ \middle|\ \begin{matrix} 1 \\ - \end{matrix}\ \middle|\ \begin{matrix} 1,1 \\ 2 \end{matrix}\ \middle|\ 1,1\right) = 2\,{}_5\mathrm{F}_4\left(\begin{matrix} 1,1,1,1,1 \\ 2,2,2,2 \end{matrix}\ \middle|\ 1\right)? \quad (5)
$$

Is it possible to generalize them?

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Miscellaneous

1. Paper by Michael Berry

In Physics Today **54** (2001), no.4, 11-12 there has appeared a very nice aticle by Michael Berry, " *Why are special functions special?* (see also the web: http://physicstoday.org/pt/vol-54/iss-4/p11.html)

In this nice paper Michael tells physicists about the importance of special functions for physics, and he is promoting the DLMF-project (successor to Abramowitz and Stegun).

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2. Death of Leonard Carlitz

The July 2001 issue of the Notices of the American Mathematical Society mentioned that Leonard Carlitz died in 1999 and that MathSciNet refers to obituaries by F. T. Howard in Fibonacci *Quart.* **38** (2000), no. 4, 316, and by Joel V. Brawley in *Finite Fields Appl.* **6** (2000), no. 3, 203-206.

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About the Activity Group

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 have around 150 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 is:

`http://math.nist.gov/opsf/`

which currently covers the topics: Conference Calendar; Books, Conference Proceedings, etc.; Compendia, tools, etc.; Compiled booklist on OP-SF; Meeting Reports; Projects; Problems; Personal, Obituaries, etc.; History; Positions available; Miscellaneous; Memberlist; Preprint Servers and Links to WWW pages of interest to members. This is a convenient point of entry to all the services provided by the Group. Our Webmaster is Bonita Saunders (`bonita.saunders@nist.gov`).

The *Newsletter* is a publication of the Activity Group. It appears three times a year and is mailed by SIAM. Back issues are accessible at:

`http://www.mathematik.uni-kassel.de/~koepf/siam.html`

and

`ftp://euler.us.es/pub/newsletter`

To receive the *Newsletter*, you must be a member of SIAM and of the Activity Group. SIAM has several categories of membership, including low-cost categories for students and residents of developing countries. For current information on SIAM and Activity Group membership, contact:

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The Activity Group also sponsors an electronic news net, called the OP-SF Net, which is transmitted periodically by SIAM. It is provided as a free public service; membership in SIAM is not required. The OP-SF Net Editor is Martin Muldoon (`muldoon@yorku.ca`). The Net provides fast turnaround compared to the *Newsletter*. To receive the Net, send your name and email address to `poly-request@siam.org`. To contribute a news item to the Net, send email to `poly@siam.org` with a copy to the OP-SF Net Editor. Please note that submissions to the Net are automatically considered for the *Newsletter*, and vice versa, unless the contributor requests otherwise. Back issues can be obtained at the WWW addresses:

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Finally, the Activity Group operates an email discussion group, called OP-SF Talk. To subscribe, send the email message

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to `listproc@nist.gov` . To contribute an item to the discussion, send email to `opsftalk@nist.gov` . The archive of all messages is accessible at:

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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 February issue 2002 is January 15, 2002.

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