Charter Renewal Application – SIAG Orthogonal Polynomials and Special Functions

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Orthogonal Polynomials and Special Functions (SIAG - OPSF). The SIAM Activity Group (SIAG - OPSF) to which this renewal applies was originally formed under the aegis of SIAM on July 15, 1990 by the SIAM Council and July 19, 1990 by the SIAM Board of Trustees with its initial operating period beginning January 1, 1990 and ending December 31, 1992. Its charter has been renewed by the Council and Board seven times thereafter. This SIAG has 141 members, including 31 student members, as of 12/31/2012.

According to its Rules of Procedure, the objective(s) of the SIAG-OPSF are:

1) Promote basic research in areas of orthogonal polynomials and special functions.

2) Further the application of this subject in other parts of mathematics, and in science and industry

3) Encourage and support the exchange of information, ideas, and techniques between workers in this field, and other mathematicians and scientists.

The group is concerned with the following topics and their applications: general systems of orthogonal polynomials (Askey scheme, asymptotic analysis, recurrence relations, numerical quadrature, Julia sets) ; harmonic analysis, approximation theory, combinatorics, coding and design theory and Markov processes; orthogonal polynomials in several variables; Special Functions in connection with Lie theory, tomography, optics, wave functions in crystals; classical special functions as well as those associated with Painlevé equations, solutions of partial differential equations; statistical and quantum mechanics, random matrices; integral transforms, number theory. Within the framework of SIAM, the SIAG will conduct activities that further its purposes.

As special tasks of the SIAG-OPSF are formulated.

Organizing activities in orthogonal polynomials and special functions. The SIAG-OPSF is expected to:

1) Organize minisymposia at the SIAM Annual Meeting on years where there is no OPSFA conference.

2) Organize a track of at least six minisymposia at the SIAM Annual Meeting at least once every five years. The VP for Programs and the VP at Large will coordinate the scheduling with the SIAG Chair.

Other activities include:

3) Dissemination of information about upcoming conferences and sponsoring special sessions at SIAM meetings. Also, the group will assist researchers in the use of symbolic computer calculations by publicizing available software for special functions. Another goal is to establish working relationships with the various SIAM journals, especially the SIAM Journal on Mathematical Analysis, with the view of encouraging the submission of manuscripts in our area.

4) With the approval of the SIAM Program Committee, the SIAG-OPSF may organize special sessions at SIAM meetings, and conduct special one- or two-day meetings immediately before or after a regular SIAM meeting on years where there is no OPSFA conference. SIAG meetings, workshops, and conferences may be organized only with the approval of the SIAM President and the SIAM Vice President for Programs.

5) Award the SIAG-OPSF Gábor Szegö Prize.

 The SIAG-OPSF has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG-OPSF.

1. List all current officers of the activity group (including advisory board, if relevant).

   Chair: Francisco Marcellán, Universidad Carlos III de Madrid, Spain.
   Vice Chair: Jeffrey S. Geronimo, Georgia Institute of Technology, Atlanta, GA, USA.
   Secretary: Peter A. Clarkson, University of Kent, United Kingdom.
   Program Director: Diego Dominici, State University of New York, New Paltz, NY, USA.

2. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last [two/three] years?

   The field of orthogonal polynomials and special functions (OPSF) has experienced much important activity during the last few years due to the contributions of individuals, many of them SIAG-OPSF members, but others coming from outside areas, for example Random Matrices, Integrable Systems, and Number Theory. New techniques from Riemann Hilbert analysis, operator theory, rational approximation, asymptotic analysis, potential theory are contributing to the knowledge and influence of OPSF. Monographs and specialized meetings offer a good opportunity to reach people with different backgrounds and this allows our field to move in areas other than Classical Analysis. One problem which is discussed below is that most of the important contributions have not appeared in the SIAM Journal of Mathematical Analysis.

   The popular monographs by G. Gasper and M. Rahman, C. Dunkl and Y. Xu, G. E. Andrews, R. Askey and R. Roy, B. Simon, M. E. H . Ismail, and P. Deift, among others, as well as the very recent *NIST Handbook of Mathematical Functions* edited by Frank Olver, Dan Lozier et al, all with contributions from members of our field, constitute a good sample of the growing impact of OPSF. Finally, the broad areas covered by the large number of events which are announced in OP-SF Net (our Electronic News Net) also show the significant advances and impact of the activities around OPSF.

3. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?

The size of our SIAG-OPSF is stable. With the proposed actions listed in below (including the Szegö Prize) we hope to increase the number of members especially young researchers and people from emerging economies. Activities aimed at these groups in this direction should not only attract more people but also increase our activity and visibility inside SIAM.

4. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years, and give a brief (one sentence or phrase) indication of the success or problems with each.

4.1.- SIAG - OPSF has been involved in the organization of several meetings. Among them we would like to emphasize one held in Washington DC in April 2011 on *Special Functions in the 21st century: Theory and Applications (dedicated to Frank W. J. Olver).*

4.2.- Several members of our SIAG-OPSF were involved in the Scientific Committee of the *International Conference on Asymptotics and Special Functions*, Hong Kong , June 2011.

4.3.- Two minisymposia on *Special Functions and Orthogonal Polynomials* and *Asymptotic analysis and high oscillations,* respectively, were organized by members of our SIAG-OPSF in the framework of the congress of Foundations of Computational Mathematics held in Budapest in July 2011.

4.4.- Our SIAG-OPSF has strongly supported the successful organization of the 11th OPSFA in Leganés, Spain (August 2011) and the 12th OPSFA at Sousse, Tunisia (March 2013). At the first meeting, 250 people attended and a volume of AMS Contemporary Mathematics Series containing the invited lectures has been edited by G. López Lagomasino, and J. Arvesú. A regular issue of Journal of Approximation Theory will appear in August 2013 with some selected contributions. In the second meeting, 200 people attended and the contributions will be published as a regular issue of the journal Integral Transforms and Special Functions with C. Berg, C. Dunkl and F. Marcellán as Guest Editors.

The Chair of SIAG-OPSF is a permanent member of the Steering Committee organizing these meetings.
The next OPSFA will be organized by NIST in Washington D. C. in July 2015.

5. Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a track at an annual meeting or meet jointly with the SIAM Annual Meeting?

Our SIAG-OPSF will organize a track at the 2013 SIAM Annual meeting to be held in San Diego, CA, in July 2013.
The Program Director of our SIAG-OPSF is a member of the Organizing Committee.

Professor Yuan Xu, University of Oregon, USA, will deliver an invited lecture (IC8 Orthogonal Polynomials and Cubature Rules). Furthermore, six mini-symposia have been approved

MS39 Orthogonal polynomials: connections and applications
MS42 Painlevé Equations - Nonlinear Special Functions
MS62 Symbolic Computation and Special Functions - Part I of II
MS75 Symbolic Computation and Special Functions - Part II of II
MS81 Multivariate orthogonal polynomials
MS103 Special Functions: Applications and Numerical Aspects - Part I of II
MS119 Special Functions: Applications and Numerical Aspects - Part II of II
MS134 Asymptotics of Orthogonal Polynomials

6. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and web sites. Have each of these been active and successful?

6.1.-The OP-SF NET (our electronic News Net) of the SIAG-OPSF appears every two months and constitutes one of the most important ways to disseminate information about scientific events related to the aims of our SIAG, updated papers and contributions as well as opinions about our activity. It is received by all our membership and we have an interesting feedback with comments and suggestions concerning our activities.

6.2.-At SIAM we have a mailing list, open to members of the SIAG-OPSF for notes, announcements and postings. We have a web page (http://www.siam.org/activity/opsf/) where recent information and the archives of our SIAG can be read.

6.3.- One of the most relevant facts in this period was the installment of the Gábor Szegö Prize. It is an   award given every two years to early-career researchers for outstanding research, as determined by the prize committee, in the area of orthogonal polynomials and special functions. The first winner was Tom Claeys (Université Catholique de Louvain, Belgium) and he received the prize on the first of the 11th OPSFA. The second one was Jacob S. Christiansen (University of Lund, Sweden) and he received the prize on the first day of the 12th OPSFA. For the second edition of this prize considerably more nominations (7) were submitted than for the first edition. This shows the growing impact of this prize in our community.

6.4.- Our SIAG-OPSF has supported the three editions of the Latin-American School on Orthogonal Polynomials and Applications (EIBPOA) held at Bogotá, Colombia, in 2011, Colima, Mexico, in 2012, and Sao Jose do Rio Preto, Brazil, in 2013. The number of participants in each of them was around 60 young researchers interested in the topics covered by our SIAG-OPSF. The next EIBPOA Schools will take place in Bogotá, Colombia (2014) and Córdoba, Argentina (2015).

7. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

7.1- To improve the support from SIAM to the OPSFA meetings held every two years and to increase participation and the quality of contributions. These meetings are an important tradition in our community and a very good place to explain our activity and our relevance. The award ceremony for the Gabor Szegö Prize includes an invited lecture by the award winner. This prize is stimulating the activity of young researchers.

7.2.- To organize mini-symposia at the SIAM Annual Meeting in years where there is not an OPSFA conference. An important question is to have financial support from funding agencies as well as from SIAM.

7.3.- To promote the organization of Summer Schools in emerging countries. We have started this process in Latin-America, but our ambition is to promote such a kind of activities in Africa and South East Asia, where we have identified individuals, teams and institutions interested in our area. The financial support for such events constitutes a critical point. The suggested interval of two years seems to be realistic.

7.4.- We plan to increase our membership by informing researchers in our area of our SIAG activities through our mailing list. Currently, the majority of our members are from the US and Europe, but we wish to expand in Latin-America, Africa and Asia.

8. How can SIAM help the activity group achieve its goals?

8.1.- SIAM should increase the participation of SIAG-OPSF members on the editorial board of SIAM Journal on Mathematical Analysis as well as to include the topic Special Functions in the journal description.

8.2.- The dissemination of relevant contributions in areas where OPSF play an important role.

8.3.- To emphasize the links between different other SIAM activity groups in areas of joint interest.

8.4.- The organization of mini-symposia in the SIAM Annual Meetings where the emphasis on applications of OPSF to other areas such as engineering, biomathematics, cryptography, computer science encourages feedback from researchers outside OPSF.

8.5.- The support to young researchers interested in our domain using the OPSF Summer Schools in order to create a critical mass and enhance the links between the different teams.

8.6.- The designation of liaison persons of our SIAG-OPSF with related scientific organizations; for example, Society for Special Functions and Applications (SSFA) in India, the Mathematical Physics interest group of the Institute of Physics (IOP) as well as inside

other organizations related to our interest areas , from either an applied or computational perspective.

9. How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?

9.1. We can contribute in the monthly SIAM News with articles related to the applications and computational aspects of OPSF.

9.2. Inside the OPSF worldwide community and, more precisely, in the events organized by our SIAG-OPSF, we can emphasize the links between OPSF and applied mathematics and computational science through plenary lectures as well as minisymposia or special sessions.

9.3. We would like to open our Newsletter to non specialists in OPSF from other scientific and technical areas where OPSF are a useful tool to motivate these non specialists to formulate questions and open problems in OPSF to our SIAG-OPSF and research community. This would quickly bring the benefits of defining the needs in OPSF research arising in scientific and technical areas other than OPSF and also create links with these other research communities where OPSF are a useful tool.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a 3 year operating period beginning 1/1/2014.

Signed

Francisco Marcellán, SIAG Chair

May 30, 2013.