

## SIAM - SIAG IMAGING SCIENCES (IS) CHARTER RENEWAL APPLICATION

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Imaging Science (hereafter called SIAG/IS). The SIAG/IS to which this renewal applies was originally formed under the aegis of SIAM on December 11, 1999 by the SIAM Board of Trustees and via electronic voting by the SIAM Council in January 2000. SIAG/IS began its operations on January 21, 2000. Its charter has been renewed by the SIAM Council and Board six times thereafter. The SIAG has 627 members as of Dec 2012. From those, 274 are student members.

According to its Rules of Procedure, the objective of the SIAG/IS is to:

- 1) Provide a forum for conferences and scientific interaction between imaging science researchers and practitioners in academia, industry, medicine and government;
- 2) Encourage research that will provide a rigorous mathematical foundation for imaging science;
- 3) Foster research in mathematics and computation that has the potential for solving real-world problems in imaging science, and leads to new methods and techniques useful in this subject;
- 4) Provide the means for rapid publication and dissemination of novel methods in imaging science.

The SIAG/IS 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/IS.

1. 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 three years?

*Imaging science is a truly interdisciplinary, multifaceted and expanding field which is growing in parallel with the technological progress and the development of new instruments, sensors and imaging modalities. It has undergone a lot of exciting developments in recent years as e.g. hyperspectral imagery, invisibility cloaking, sparse recovery and compressed sensing, inverse problems arising from new imaging techniques and hybrid methods. To face the need for automated analysis/inversion of images and to face 'big data' challenges, the focus is shifting more and more towards mathematics and the use of increasingly sophisticated mathematical, statistical, and computational methods. Strong and fruitful interactions are observed with many traditional and newer areas of applied mathematics such as harmonic analysis, nonlinear optimization, numerical linear algebra, integral equations, partial differential equations, differential geometry, statistical estimation, stochastic modeling, information theory, computer graphics, machine learning, uncertainty quantification, etc.*

*A token of the good health of the field is the fact that the SIAM Journal on Imaging Science (SIIMS), which started in 2008, ranks now second (after SIAM Review) in terms of impact factor among all journals in applied mathematics (Thomson Reuters JCR 2011).*

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

*As the field it represents, the activity group is doing well and is definitely vibrant.*

*After an initial period of growth, the size of the activity group seems now more or less stable, with nevertheless a slight decrease of the number of student members.*

*Progress and new trends in the field can be most easily monitored through the SIAG/IS conferences and also through the papers published in the scientific literature.*

*Imaging science is a great source of new mathematical challenges, cutting across disciplines, and this stimulates research in various domains of applied mathematics.*

3. 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.

*The major event organized by the SIAG is the biennial SIAM Conference on Imaging Science. The list of past conferences may be found at <http://www.siam.org/meetings/archives.php#imaging>. The last conference was in Philadelphia, PA in May 2012; it comprised 5 invited plenary presentations, 1 prize lecture, 77 minisymposia sessions, 61 contributed papers as well as 2 minitutorials. There were 398 attendees among which about 20 % students. According to the survey performed among participants as well as to informal feedback, the conference was globally highly appreciated. Suggestions for improvements will be taken into account for the future IS conferences.*

*The Gene Golub SIAM Summer School 2011 dedicated to “Waves and Imaging” (with as teachers SIAG/IS members Margaret Cheney and Laurent Demanet) has been co-sponsored by the SIAG/IS.*

4. 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?

*A significant part of the program of both last SIAM annual meetings is dedicated to imaging science.*

*At the AN12 meeting in Minneapolis, besides the invited plenary talk by SIAG/IS member Tony Chan, there were no less than 10 minisymposia sessions and 2 contributed papers sessions directly related to imaging, inverse and sparse recovery problems.*

*At the coming AN13 meeting in San Diego, two SIAG/IS member will be honored: Stanley Osher will give the John von Neumann Lecture and Margaret Cheney the Sonia Kovalevsky Lecture. Jennifer Mueller is the SIAG/IS representative in the Organizing Committee (which includes also the SIAG/IS member Omar Ghattas). Besides an invited talk on photoacoustic tomography by L. Wang, there will be 17 minisymposia sessions on various aspects of imaging science, organized by several SIAG/IS members: M. Cheney, G. Lerman, J. Mueller, N. Saito and H. Zhao.*

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

*The SIAG/IS activity group aims at actively promoting the field of mathematical imaging to broad audiences, in particular through the following channels.*

*SIAG on Imaging Science Prize (SIAG/IS Prize) was established in 2010. It is to be awarded every two years at the SIAG/IS biennial conference to the authors of the best paper, as determined by the prize committee, on mathematical and computational aspects of imaging, broadly interpreted. Imaging includes image formation, inverse problems in imaging, image processing, image analysis, image interpretation and understanding, computer graphics, and visualization. The first SIAG/IS Prize has been awarded in May 2012 at IS12 in Philadelphia and the call for nominations for the 2014 Prize has recently been posted (see <http://www.siam.org/prizes/sponsored/siagis.php> ).*

*SIAG/IS has a website at: <http://www.siam.org/activity/imaging/> . The website has been reorganized and comprises now a Wiki ([http://wiki.siam.org/siag-is/index.php/Main\\_Page](http://wiki.siam.org/siag-is/index.php/Main_Page)). As a forum for research in imaging, ‘Featured Images’ will be regularly displayed. Moreover, to give more visibility to young researchers, it has been decided to post announcements of defended PhD theses in the field of imaging. As an encouragement to students to join the field, information will also be collected about courses on imaging taught worldwide with links to the corresponding homepages. Besides, announcements about conferences, jobs, etc. are regularly sent via the SIAG/IS mailing list.*

*Our liaison representative with SIAM News, Samuli Siltanen, wrote a paper in the June 2012 issue about the Calderón Prize winner Guillaume Bal and nonlinear inverse problems. Other papers about imaging appeared in SIAM News during the last two years, namely those by N. Trefethen about the von Neumann lecture by Ingrid Daubechies at ICIAM 2011 (September 2011), by V. Caselles about inpainting (December 2011), by C. Bandle, H. Levine, F. Santosa and H. Weinberger about the work of Larry Payne (May 2012), and by N. Trefethen about Tony Chan (September 2012).*

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

*The next biennial SIAM Conference on Imaging Science IS14 will be organized for the first time outside the US in Hong-Kong. The general Co-chairs are Fadil Santosa, Barbara Kaltenbacher and Michael Ng. More information can be found at <http://www.math.hkbu.edu.hk/SIAM-IS14/>. This event will contribute to increase the visibility of the SIAG/IS in Asia.*

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

*SIAM could help the activity group by establishing or reinforcing links with other scientific societies dealing with imaging problems (IEEE, OSA, ASA, etc) as well as with applied mathematics societies in the world (GAMM, SMAI, SIMAI, etc.) and by encouraging and supporting joint activities.*

*Contacts have been taken with the newly created GAMM-Activity Group "Mathematical Signal and Image Processing" (<http://www3.math.tu-berlin.de/numerik/GAMM-MSIP/>) with the aim of organizing a joint conference in the future.*

*More financial support for young researchers to attend the IS conferences would also be welcome.*

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

*The activity group helps SIAM promoting applied and computational mathematics in the sense that, as already stressed in the answers to Questions 1 and 2, the field of imaging science is a marvelous area where to see various branches of applied mathematics in action on some concrete scientific and industrial problems. It is also a source of nice new mathematical challenges, which is a good incentive for more researchers and students to join the field.*

In conclusion, the SIAG/IS requests that the SIAM Council and Board of Trustees renew his charter for a two-year operating period beginning January 1, 2014.

Signed

Christine De Mol

Chair, SIAM Activity Group on Imaging Sciences  
May 31, 2013