EDUCATION CORNER

AN OVERVIEW OF EDUCATION ACTIVITIES IN THE IEEE GEOSCIENCE AND REMOTE SENSING SOCIETY

Antonio J. Plaza, Education Director, IEEE Geoscience and Remote Sensing Society, Hyperspectral Computing Laboratory, University of Extremadura, Cáceres, Spain, Email: aplaza@unex.es – URL: http://www.umbe.edu/rssipl/people/aplaza

1. Overview
Education is very important for the IEEE Geoscience and Remote Sensing Society (GRSS). As the world’s largest remote sensing science and engineering organization, GRSS has an important responsibility to educate the new generation of geoscience and remote sensing scientists. The outstanding work carried out by Granville Edward Paules, III, who served as Education Director of GRSS until January 2011, included many pioneering contributions, such as the setting-up of web broadcasts of plenary sessions of GRSS major international conferences, on-line tutorials developed with national and international academics, and a successful and equitable student travel program. Many of the education-related activities currently being pursued by GRSS are inspired by Gran Paules outstanding achievements as Education Director. In this contribution, we describe some ongoing activities of GRSS in the area of education, including (present and planned) activities carried in conferences and symposia, web-based tools, e-learning and social networks, the society’s travel grant program, the student paper contest carried out in the society’s GRSS flagship conference, the IEEE Geoscience and Remote Sensing Symposium (IGARSS), and other activities and future directions of GRSS in terms of education activities.

2. Education Activities in Conferences and Symposia
The GRSS tutorials are an important mechanism for dissemination of research topics of interest to both young and experienced geoscience and remote sensing scientists. They are held during IGARSS and other focused symposia. For instance, a total of nine tutorials were organized in conjunction with IGARSS 2011 in Vancouver, Canada, including four full-day tutorials on the topics of SAR polarimetry, spectral unmixing of hyperspectral data, advanced classification techniques, and image information mining. Also, five half-day tutorials were organized on the topics of data modeling and information estimation in multichannel radar remote sensing, complex-valued neural networks, InSar for geoscientists, SAR tomography and NASA’s newest Earth-observing satellite, the Next Generation Joint Polar Satellite Mission Preparatory Project (NPP). These tutorials were taught by highly distinguished experts in their research fields. Their goal was to seek a consistent, high quality approach in the presentation of these specialized topics. The deadline for submitting tutorial proposals for IGARSS 2012 in Munich, Germany, is December 15th, 2011.

An ongoing effort in GRSS is the organization of a series of summer/winter schools, to be held in conjunction with IGARSS and/or other GRSS symposia. This effort follows successful cases in other IEEE societies, and the goal is to provide a general overview of selected topics in geoscience and remote sensing to graduate students, taking advantage of the expertise of worldwide experts attending the specialized symposium. Hence, the schools will be mainly directed to young scientists in the vicinity of the location where the GRSS symposium is being organized, but they will remain open to the wide scientific community and properly advertised through GRSS communication channels. The topics addressed in the schools will not overlap with those explored in the tutorials, with a clear target to transfer knowledge to new young scientists in the field (not necessarily attending IGARSS due to their young age or early-stage career). This initiative is currently under development at GRSS, with an active involvement of the Education Director taking advantage of other similar initiatives carried out in geoscience and remote sensing educational projects such as the Marie Curie Research Training Network “Hyperspectral Imaging Network” (Hyper-I-Net) funded by the European Commission, which has made possible that part of the infrastructure to organize such schools is already in place.

3. Web-based Tools, E-learning and Social Networks
One of the main goals of GRSS is to establish the society website as the natural means of communication and technical information exchange between GRSS members and the global remote sensing community as a whole. For this purpose, the website has greatly expanded the capabilities for remote attendance at symposia and GRSS events. A good example is the live broadcast through the society’s website of all oral technical sessions of IGARSS 2011 held in Vancouver,

1 http://www.igarss12.org/TutorialProposals.asp
2 http://www.hyperinet.eu
Canada. This effort, coordinated by Steven C. Reising (GRSS Vice-President of Information Resources), represents a major contribution that will increase the impact and outreach of our society’s symposia even more. An ongoing activity in this area is the creation of interactive video education tools and their integration in the GRSS society website, which already comprises tutorials and documents including the interactive “Ask an Expert” feature, and a catalog of PhD Theses defended in recent years. More advanced tools such as interactive online lectures, tutorial and courses, complemented by self-assessment tests, are currently under development to be integrated with GRSS website under the education section.

Another ongoing effort is the creation of a social network in GRSS, intended to communicate scientists working in different disciplines of geoscience and remote sensing. The main motivation is that social networks play an important role in our life and they can also help the GRSS community in automatically identifying experts for education-related activities, paper reviewing, and other activities. In this regard, a very important development in recent years has been the extensive LinkedIn community formed in the context of the GRSS Data Fusion Technical Committee chaired by Fabio Pacifici and Qian Du. The online group and discussion forum has boosted the number of participants in the last few months thanks to the outstanding effort by the chairs and could be used as a baseline for creating a GRSS social network.

4. Travel Grant Program
An important initiative within GRSS is the IGARSS travel merit scholarship selection process. This initiative allows many GRSS students and members to obtain funding support in order to travel to the GRSS flagship symposium. A total of 109 applications were received for the IGARSS 2011 in Vancouver, Canada. 22 applications were redirected to a separate fund to support requests coming from Asia. These applications were overseen by Motoyuki Sato, General Chair of IGARSS 2011, who did an outstanding effort to minimize the impact of the venue reallocation from Sendai, Japan, to Vancouver. The main innovation introduced in the travel grant program in 2011 is that, historically, travel grants were awarded only to researchers giving oral presentations at IGARSS. In 2011, however, the oral presentation rule was not observed as it was believed to downgrade poster presentations. After a careful selection process, in which lower priority was assigned to those applications in which other partial support (e.g. local funds) were available, a total of 59 applications were partially funded (this means around 70% of the eligible applications). Since the applicants estimated the travel costs assuming that Sendai would be the venue of IGARSS, the airfare costs were recalculated using Vancouver as the new destination. This involved a careful evaluation of the travel grants on a case-by-case basis. The whole procedure was overseen by Jon A. Benediktsson (GRSS President), Melba Crawford (Executive Vice-President), Adriano Camps (Vice-President of Meetings and Symposia), John Kerekes (Vice-President of Technical Activities), and Steven C. Reising (Vice-President of Information Resources). Their support and recommendation are gratefully acknowledged. The travel grant application form for IGARSS 2012 in Munich, Germany, is available at the IGARSS 2012 website.

5. Student Prize Paper Competition
The student prize paper competition, overseen by Martti T. Hallikainen (GRSS Publications Awards Committee Chair), is an important education-related activity in GRSS society. This year ten finalists were selected by a committee of experts to present their papers during a special session at IGARSS 2011 in Vancouver, Canada. The ten finalists gave rise to a high level and very tough competition. Prizes were announced at the IEEE GRSS awards banquet. The First Prize (Mikio Takagi Student Prize) was awarded to Xueyang Duan for the contribution “Vector electromagnetic scattering from layered rough surfaces with buried discrete random media for subsurface and root-zone soil moisture sensing,” by Xueyang Duan and Mahta Moghaddam. The Second Prize was awarded to Mauro Dalla Mura for the contribution “A general approach to the spatial simplification of remote sensing images based on morphological connected filters,” by Mauro Dalla Mura, Jon A. Benediktsson and Lorenzo Bruzzone. The Third Prize was awarded to Adel Elsherbin and Lorenzo Bruzzone. Although we have described some of the most relevant education-related activities currently being pursued by GRSS, other relevant activities have not been addressed in detail. For instance, the GRSS distinguished speakers program chaired by David M. Le Vine (GRSS Distinguished Speakers Program) is an important education-related activity in GRSS society. This initiative allows many GRSS students and members to obtain funding support in order to travel to the GRSS flagship symposium. A total of 109 applications were received for the IGARSS 2011 in Vancouver, Canada. 22 applications were redirected to a separate fund to support requests coming from Asia. These applications were overseen by Motoyuki Sato, General Chair of IGARSS 2011, who did an outstanding effort to minimize the impact of the venue reallocation from Sendai, Japan, to Vancouver. The main innovation introduced in the travel grant program in 2011 is that, historically, travel grants were awarded only to researchers giving oral presentations at IGARSS. In 2011, however, the oral presentation rule was not observed as it was believed to downgrade poster presentations. After a careful selection process, in which lower priority was assigned to those applications in which other partial support (e.g. local funds) were available, a total of 59 applications were partially funded (this means around 70% of the eligible applications). Since the applicants estimated the travel costs assuming that Sendai would be the venue of IGARSS, the airfare costs were recalculated using Vancouver as the new destination. This involved a careful evaluation of the travel grants on a case-by-case basis. The whole procedure was overseen by Jon A. Benediktsson (GRSS President), Melba Crawford (Executive Vice-President), Adriano Camps (Vice-President of Meetings and Symposia), John Kerekes (Vice-President of Technical Activities), and Steven C. Reising (Vice-President of Information Resources). Their support and recommendation are gratefully acknowledged. The travel grant application form for IGARSS 2012 in Munich, Germany, is available at the IGARSS 2012 website.

6. Other Education-Related Activities
Although we have described some of the most relevant education-related activities currently being pursued by GRSS, other relevant activities have not been addressed in detail. For instance, the GRSS distinguished speakers program chaired by David M. Le Vine (GRSS Distinguished Speakers Program)
Committee Chair) provides GRSS members with an opportunity to interact with experts in areas of interest to the geoscience and remote sensing community. It is an opportunity to learn about some of the exciting work being done in our discipline and to meet some of the prominent members of our society. The society also promotes exhibits and selected technical and general tutorials on various topics, all available through the society website (under education resources).

Another important work in progress is the GRSS Doctoral Fellowship Program, that will be coordinated with the GRSS Globalization Effort led by Anthony K. Milne (GRSS Past President). The overall strategy of this program, still under discussion in GRSS, is to support the PhD for outstanding students. Excellence of the PhD candidates should be a primary requirement, and the target will be on emerging countries. Travel support will be provided to recognized international mentors to work with these students. Among the potential benefits of such a program are the active collaboration of GRSS with the local institution through the involvement of an experienced mentor, the participation of the PhD student in major GRSS symposia such as IGARSS (through travel support awarded to the student), and the reinforcement and visibility of GRSS society in the country of origin of the PhD student, allowing for the establishment of solid links for collaboration in the future.

Last but not least, it is important to emphasize that the major education-related distinction in our society is the GRSS Education Award, which aims at rewarding significant educational contributions in the field of remote sensing. In selecting the individual, the factors considered are: significance of the educational contribution in terms of innovation, and the extent of its overall impact. The award is considered annually, but is only awarded when an outstanding recipient is identified. A description and nomination form is available online. The 2011 Education Award was presented at IGARSS 2011 to Richard Bamler from the German Aerospace Center (DLR), Oberpfaffenhofen, Germany, with the citation: “In recognition of his significant educational contributions to Geoscience and Remote Sensing.”

7. Summary and Future Directions
In this article, we have summarized the ongoing and planned education-related activities at GRSS. The society puts forth a lot of effort in remote sensing education initiatives, development and collection of educational resources, college/graduate education as well as continuing education for professionals. These initiatives are intended to provide GRSS members and all persons involved in GRSS' fields of interest with accessible and affordable high-quality education products. In the future this will not only be done using the mechanisms described here, but also through other IEEE channels such as our GOLD (Graduates of the Last Decade) program, the IEEE eLearning Library, the IEEE on-line education portal, the IEEE pre-University education portal, or the IEEE Women in Engineering (WIE), the largest international professional organization dedicated to promoting women engineers and scientists. It is the goal of GRSS that the activities described here create an impact in the young scientists that will be leading the future expansion of geoscience and remote sensing. It is also the responsibility of GRSS to provide high-quality training (in both scientific aspects and complementary skills such as ethical issues, communication skills, enterprise and project management skills, etc.) to this new generation of researchers and scientists. To this end, the society will continue conducting dynamic programs that encourage interest in remote sensing and geoscience education and promote new approaches for remote sensing education and dissemination of knowledge.

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9 http://www.grss-ieee.org/education/exhibits
10 http://www.grss-ieee.org/about/awards/grs-s-education-award
11 http://IEEE-elearning.org
12 http://IEEE-elearning.org/outreach
13 http://www.tryengineering.org
14 http://www.ieee.org/membership_services/membership/women/index.html