Francesco Vannicola, U.S. Naval Research Laboratory, served as the general chair for the 2014 PTTI Meeting. The 47th annual PTTI Systems and Applications Meeting will be held at the Hyatt Regency, Monterey, California, January 25-28, 2016, co-located with the 2016 ION International Technical Meeting.

The Institute of Navigation once again supported an African Outreach Program that was held in Kigali, Rwanda, in summer of 2014, continuing a series of nearly annual workshops that began in 2009. The program brings together GNSS and space science experts from around the world to introduce global navigation satellite systems and many of their applications for societal benefits and scientific exploration. Since the beginning, ION has generously cosponsored this program by covering the travel expenses of ION members teaching at the workshop.

The most recent workshop took place at the University of Rwanda. My co-directors for this workshop included Professor Sandro Radicella of the International Center for Theoretical Physics (ICTP) in Trieste, Italy, and Dr. Jean Uwamahoro of the University of Rwanda. The program was cosponsored by Boston College, the International Center for Theoretical Physics in Trieste, Italy; the Minister of Education, Republic of Rwanda; the International Committee on GNSS, and the University of Rwanda.

Some 63 participants comprised this year’s gathering, including lecturers and students from all over the world, with the majority of students coming from the East African region. In addition to topics on GNSS technology and applications, topics addressed the summer solar, magnetospheric and ionospheric phenomena and their impact on the near-Earth space environment.

The summer school creates an opportunity for senior and young African space scientists to interact and share knowledge in space science with worldwide experts—strengthening the vision and understanding of the importance of GNSS and other technologies with a particular focus on space weather and its effects on our everyday life. Program participants learned how solar explosive phenomena can influence the functioning and reliability of spaceborne and ground-based systems and services or directly endanger human health.

Among the coursework offered by ION members were lectures on GNSS Fundamentals by Dr. John Raquet, including a laboratory that taught participants how to calculate a position using RINEX data and use of simple Matlab routines. Dr. Frank van Diggelen brought the latest technology in mobiles phones to demonstrate the benefits and use of integrated GNSS. Of particular interest to students was being able to use the phones outdoors to see just how many satellites and constellations could be seen from our location in Kigali.

Dr. Mikel Miller presented a thought-provoking lecture on “Got GPS? The Navigation Gap.” Just when they had been convinced that GPS was the answer to all our PNT problems, this presentation provided insight into alternative solutions.
methods for achieving such capabilities as guiding unaided autonomous vehicles. Although he was unable to attend due to travel delays, Dr. Todd Walter prepared a presentation on GNSS Effects on Navigation Systems that I gave in his place.

Dr. Keith Groves offered a comprehensive tutorial on the ionosphere — nicely tying in the effects that the ionosphere has on GNSS. Dr. Endewako Yuzengw discussed the importance of space weather on our daily lives, and Dr. Anthea Coster contributed some fascinating insights on geomagnetic storms. One evening during the workshop, Frank and Keith combined their skills to use Frank’s phones to record scintillation from the roof of our hotel. The measurements were described at the workshop, but a bit more work needs to be done on the analysis before the results are ready for formal presentation.

Presentations from space scientists and GNSS experts from other parts of the world complemented the lectures provided by the ION members. These included Dr. Yannick Beniguel and Dr. Christine Amory, France; Dr. Christian Monstein, Switzerland; Dr. Babatunde Rabiu and Dr. Daniel Okho, Nigeria; Dr. Nkundabakura Phaneas and Dr. Jean Uwumahora, Rwanda; Dr. Vafi Doumbia, Cote D’Ivoire (Ivory Coast); Dr. Patrick Sibanda, Zambia; Dr. John Bosco Habarulema and Dr. Pierre Colliers, South Africa; and Dr. Bruno Nava, Dr. Luigi Ciraulo, and Dr. Claudia Paparini of the ICTP.

We were particularly pleased to feature the African lecturers in this workshop as they had all been student/participants in our earliest workshops. This is a clear sign that our goals of enhancing and encouraging the use of GNSS in Africa has been successful.

We were also delighted to be joined on the first and last days of the workshop by dignitaries from the Rwandan government. These included the Honorable Vincent Biruta, Minister of Education; Dr. Marie Christine, Director General S&T Ministry of Education; Dr. Nelson Jumba, University of Rwanda Vice Chancellor for Academic Research; Dr. Manasse Mbonye, University of Rwanda Principal and Mr. Michael Hughes, Advisor to the Minister of Education. Their participation indicates a dedication to space science education and the acceptance and use of GNSS in Rwanda.

I want to thank the ION for its continuous support of the African Outreach Program throughout the five workshops held to date and for being one of the keys to the program’s success. The Rwandan GNSS summer school was the first held on the African continent, which required a lot more planning but helped attract the attention of local government leaders to the benefits of GNSS. My heartfelt thanks to the lecturers who have participated in the Rwanda workshop and all of the earlier and future workshops. Their kindness and the selfless generosity of their time and expertise is truly admirable.

We are now planning the sixth workshop, which will again be held at the ICTP in Trieste, Italy, in March 2015. The success of the workshops has become well known in Africa and around the world. As such, we have had many applications from hopeful participants from other developing nations in South America, Indonesia, Thailand, and India. Perhaps it’s time to expand our focus.

Editor’s note: Patricia Doherty was awarded a Fellowship in the African Geospace Society last year — partially as a result of her leadership role with the African Outreach Program workshops. The award was announced at the African Geospace Society (AGS) meeting earlier in the year in Nigeria. However, she was not able to travel there to accept the award during the AGS event, so, she received the award at the summer workshop.

ION member instructors in a post-workshop trek to Volcanoes National Park to view the rare Mountain Gorillas of Rwanda. Pictured (from left) Patricia Doherty, Keith Groves, Anthea Coster and Frank van Diggelen.

Dr. Frank van Diggelen, Broadcom Corporation, demonstrates methods for determining satellite locations on a mobile phone.

Graduates of 2014 Africa Outreach Program, Co-director Pat Doherty front row center.

H O sting this event in Rwanda in 2014 was particularly noteworthy as it coincided with the 20th anniversary of the Rwandan genocide of 1994, which occurred during a civil war in that country. Approximately 800,000 Tutsis and moderate Hutus were massacred over a period of 100 days. ION members visited the Kigali Genocide Memorial Center that commemorates the dark days of the genocide and is the home to a moving permanent exhibition for the benefit of survivors and young people. It is also the site of mass graves where more than 250,000 genocide victims are buried. Our group placed flowers on a mass grave in memory of the victims and survivors of this tragic history. Although this was an emotional day for all, it evoked much admiration for the amazing Rwandan people. They lived through horrific times yet they are warm and hospitable as they continue to rebuild their country and a peaceful society with strong dedication to forgiveness and renewal.

The ION lecturers were also grateful to be housed at the Hotel des Milles Collines in Kigali, a large and lovely venue. It became famous after more than 1,200 people took refuge inside the building during the Rwandan genocide. This story of subsequent events at the hotel and the heroic actions of its manager at that time, Mr. Paul Ruseyabagina, served as the basis of the film Hotel Rwanda.

D r. Patricia Doherty, immediate past president of ION and co-director of Africa Outreach Program, places a wreath at the Kigali Genocide Memorial Center.

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