



NEWSLETTER

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GETTING TO KNOW YOU

African university researchers and U.S. GNSS experts meet in Trieste at the first Satellite Navigation and Technology for Africa Workshop

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At the end of the first Satellite Navigation and Technology for Africa conference, participating scientists received GNSS textbooks and certificates. The hottest takeaway, however, were the Boston College baseball caps donated by one of the main sponsors.



GPS Block IIR-20(M) awaiting March 24 launch of SVN49 with L5 signal payload.

GNSS can help the countries of Africa achieve their science and technology plan of action for problems of hunger, poverty, environmental devastation, and natural disasters and integrate fully into the world economy. That's the hope of 50 African scientists and engineers who participated in the first Satellite Navigation and Technology for Africa Workshop held in March in Trieste, Italy.

"The scientists wanted to learn as much about GNSS as we could provide," said organizer Pat Doherty. "We worked from 8 a.m. to 5 p.m. each day, and we were often in the laboratory well into the evening.

The U.S. lecturers were particularly delighted with the keen interest level of their African colleagues, and many said this was the most enriching teaching experience of their career."

The two and a half week long workshop, sponsored by Boston College and the Abdus Salam International Centre for Theoretical Physics (ICTP), was the brain-child of ION executive committee member Pat Doherty and Sandro Radicella, head of the ICTP Radiopropagation Laboratory.

The two scientists have worked together on several projects involving ionospheric

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WHAT

*Satellite Navigation and Technology
for Africa Workshop*

WHEN

*March 23-April 9 2009
And again in 2010*

WHERE

*Abdus Salam International Centre
for Theoretical Physics (ICTP),
Trieste, Italy*

ABOUT

*African scientists and engineers
explore GNSS applications to
increase food security, manage
natural resources, provide
emergency location services,
improve surveying and mapping,
and make land, water and air
navigation systems safer
and more precise.*

SPONSORS

*ICTP, Boston College, ION, FAA,
AFRL, UNOOSA*

DIRECTORS

*Patricia Doherty, Boston College
Sandro Radicella, ICTP*

BY THE NUMBERS

50 African scientists participated

*50 Boston College
baseball caps appeared*

*25 GNSS experts lectured (20
ION members in the mix)*

9 countries represented

*6 schools and organizations
sponsored*

15 Mindstorm robots built

*Uncounted number
of gelati served*

effects on GNSS. In organizing the workshop, their goal was to bring GNSS science and technology to African universities — the key to dispersing such critical information throughout the continent.

Twenty-five GNSS experts, 20 of whom were ION members, taught classes, led laboratory projects, and consulted individually with the African academics. Participants came from 18 universities in 12 countries.

One of the ION participants, Mike Miller of the Air Force Research Laboratory, characterized his experience there as “a truly amazing, inspiring, yet very humbling day.”

Networking

But it took a while for the university researchers, mainly from sub-Saharan Africa, and the GNSS experts, mainly from the United States, to establish the easy give-and-take that would make the workshop a success.

Doherty said people clustered in national and university groups at the opening dinner. “By the end, all kinds of collaborations were made. Scientists from Uganda, Kenya and Zambia are even planning to establish a regional network for scientific studies using GNSS, and I



The workshop took place at co-host ICTP's beautiful and affordable facility on the Adriatic Sea.

was delighted when they asked me to be an advisor.”

This groundbreaking event pointed the way to another collaborative possibility. Many research programs use GPS ground- and space-based measurements. But studies over the African region have not been possible due to the lack of dependable, long-term measurements. The workshop and the discussions may lead toward establishing a foundation of measurements for joint studies between American, European, and African colleagues.

What is a LEGO®?

The workshop wasn't all talk. Lecturers integrated formal presentations with hands-on practice in GNSS architecture, signal structure, hardware design, state of the art applications, and scientific exploration using GNSS.

They devoted the first week to GNSS basics, the second to cutting-edge technologies, and the third to scientific exploration, including space weather and atmospheric monitoring.

Lecturers also spent a good deal of time on individual consultations, which the participants especially liked.

An on-site computer laboratory gave participants ample opportunities to perform positioning calculations, use mapping and surveying soft-



ION donated 15 LEGO's Mindstorm® Robot kits for a lab demonstrating autonomous navigation. (L to R) Zacharie Komenan Zaka, University of Cocody, Cote D'Ivoire; Dr. Auguste Yankey, Dept. of Human Resources Science and Technology Div., African Union Commission; Tresor Marius Tanoh and Dr. Olivier Obrou, University of Cocody; work on their version.

ware, plan a precision farming procedure, and analyze atmospheric and ionospheric data — all from GNSS measurements.

In one of the laboratories, participants built LEGO® Mindstorm® robots to demonstrate the concept of autonomous navigation. The Mindstorm® kits — which include a 32-bit ARM7 microcontroller with picture programming, USB and Bluetooth communications, sensor and motor ports — were donated by The Institute of Navigation.

The Mindstorm® kits are the same as those being used in the ION Mini-Urban Challenge organized with the AFRL Munitions Directorate, and each university team that participated in the Trieste workshop received one.

In groups of four or five, participants followed instructions to build a robot out of the plastic LEGO® building blocks and Mindstorm package that automatically followed an oval track.

This was no simple task.

“Our participants never gave up,” Doherty said. “Many stayed in the lab late into the evening to finish their robots. But they had never heard of or seen LEGOs before. When I told one group that LEGOs are common toys for U.S. children, they were surprised. Something as simple as LEGOs reminded me that we came from different worlds.”

“They absolutely loved the Mindstorms,” said Miller, who taught the class with his son, Air Force Lt. Casey Miller, co-organizer of the Mini-Urban Challenge. “They were probably a highlight for them. In fact, the students — senior professors, junior professors and graduate students — worked through their afternoon break, past the scheduled stop time (5:30) until 7:15 p.m., building and writing software to get their robots to work autonomously. We finally had to ‘kick’ them out of the lab.”

And then there was the geocaching exercise.

Teams of four or five members used single-frequency GPS receivers in a treasure hunt cunningly planned by the instructors. Teams took off at 10-minute intervals to navigate a course that spanned the ICTP campus. The winning team



GNSS WOMEN: All 10 of the women who participated ate dinner together one night at a nearby restaurant. Workshop director Pat Doherty (second row, fourth from the left) said, “By the end of the dinner, we regarded each other as friends.”

returned in just over an hour. Everyone else took a lot longer — perhaps they stopped at local ice cream stands to buy gelatos, Doherty said.

At the end of the workshop, participants received GNSS textbooks and certificates. But the best gifts were Boston College baseball caps for everyone.

Finding Common Ground

The scientists came from very different countries and cultures — from Cote d’Ivoire, Egypt, Ethiopia, Ghana, Kenya, Morocco, Nigeria, Uganda and Zambia, with presenters mainly from the United States as well as the UK, South Africa, and Italy.

But yet another subgroup found common ground in the three-week symposium.

All 10 of the women who participated ate dinner together one night at a nearby restaurant. The African scientists, who told the Americans that marriage at 12 or 13 was still common in rural villages, seemed to have had strong mothers and supportive fathers who valued their daughters’ education, said Doherty.

“They were interested as well in our stories of first- and second-generation American families, how we interact with our husbands and children, and how we came to our current professional status,”

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THE AFRICA WORKSHOP ION GNSS EXPERTS

*Dorota Grejner-Brzezinska
Charlie Carrano
Anthea Coster
Susan Delay
Pat Doherty
Reza Ehsani
Keith Groves*

*Chris Hegarty
Richard Langley
Demetrio Matsakis
Casey Miller
Mikel Miller
Jade Morton
Pratap Misra*

*John Raquet
Gopi Seemala
Susan Skone
Cesar Valladares
A.J. Van Dierendonck
Todd Walter
Phil Ward*

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she said. "By the end of the dinner, we regarded each other as friends. We even swapped a recipe or two."

What's at Stake

In November 2003, UNESCO (the United Nations Educational, Scientific, and Cultural Organization) developed a structure for transformation of the African continent. The Trieste workshop took place within that context.

The Science and Technology Plan of Action clearly states Africa's commitment to develop and use science and technology for socio-economic transformation and full integration into the world economy. The leading problems that continue to cripple much of Africa include hunger, extreme poverty, erosion of natural resources and natural disasters.

GNSS can help address these problems. Specifically, GNSS applications can be used to increase food security, manage natural resources, provide efficient emergency location services, improve surveying and mapping, and provide greater precision and safety in land, water and air navigation systems. It also has applications in numerous fields of scientific study including space weather, geophysics,

geography, geology, ecology and biology.

Dozie Ezigbalike, a visitor from the UN Economic Commission of Africa who presented to the ION International Technical Meeting last January, addressed participants at the end of the workshop. Ezigbalike talked about the need for GNSS in Africa, and the necessity for the African academics to use it in their classrooms and in their research.

In a private conversation, Ezigbalike told Doherty that the Trieste event was tailor-made for the needs of Africa, and he commended the organizers on the project.

For his part, Mike Miller noted that several African faculty had approach him "with questions and projects they are working on — from simple robot 'walking' plow equipment to a Kenyan university's current effort to build a small satellite."

Another workshop participant, Herb Carlson, with the Air Force Office of Scientific Research/European Office of Aerospace Research & Development, summed up the event in this way: "Bright motivated talent was found and collected, the instruction is stellar, the commitment from every direction is tangible, and bonds are reaching across traditional boundaries."

Same time next year

Doherty said plans have already been approved by Boston College and ICTP to repeat the workshop in Trieste in March or April of next year. They also plan regional workshops in Egypt, Nigeria, and Kenya.

"Now I just have to find the money," she added. ♦

The prime sponsors for this workshop include the ICTP, Boston College, The Institute of Navigation, the Federal Aviation Administration, the Air Force Research Laboratory and the United Nations Office for Outer Space Affairs.

These sponsors together with the lecturers and African participants represent a diverse collection of people who are committed to provide GNSS technology for socio-economic benefits and scientific exploration in Africa.

ION Eastern Region Vice President Patricia Doherty designed and led the GNSS Africa workshop. She directs the Institute for Scientific Research at Boston College. Co-organizer Sandro Radicella is head of the Radiopropagation Laboratory at the Abdus Salam International Centre for Theoretical Physics. ICTP fosters advanced studies and research in developing countries.

