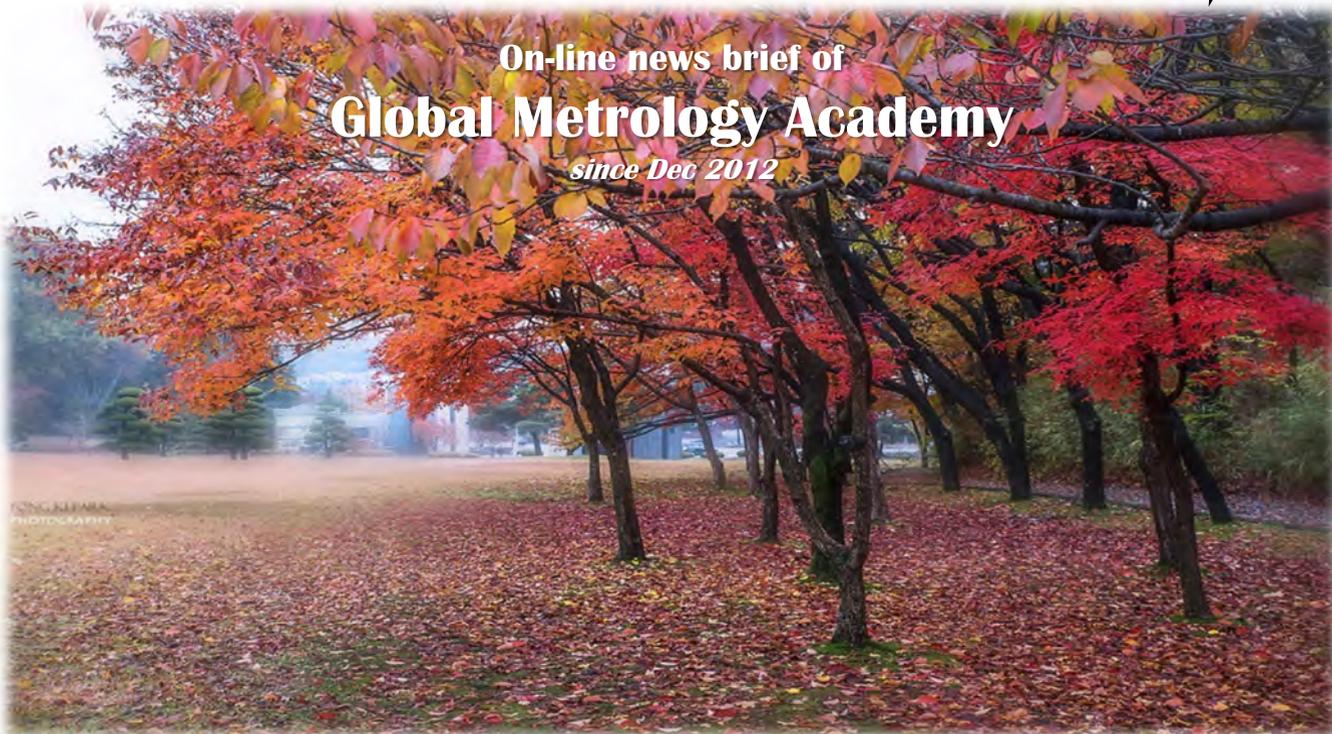


GMA Talk

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On-line news brief of
Global Metrology Academy
since Dec 2012



KRISS
GMA GLOBAL
METROLOGY
ACADEMY

WARMEST GREETINGS & BEST WISHES!

FROM THE EDITOR-IN-CHIEF



Dear Readers and GMAsers:

Welcome to the issue #4 of GMA TALK, the news brief of Global Metrology Academy. Assigned to serve our customers to help promote their capability as metrologist, GMA develops and offers programs of HRD in metrology. GMA TALK #4 presents you what we have achieved in 2016 with our services of group and individual courses both for foreign and local customers. More than 80 people came to KRISS from abroad and enjoyed opportunities of technical study on the selected subjects of measurement science and technology. As a result of its continued effort to widen the horizon of its programs, GMA was able to offer a group course of “Metrology and Quality (MnQ).” The MnQ course has enabled GMA to serve its customers with not only technical subjects but also strategic issues of metrology, attracting a new group of audience comprising directors and quality managers of metrology laboratories, and government officials.

GMA is ready to offer three group courses in 2017, each of which will address the theme of metrology in mass and related quantities (MRQ), length and dimensional metrology (LDM), and thermometry and humidity (TH), respectively. The course programs are designed to put the emphasis on hands-on exercises in ways that can more effectively deliver knowledge and practical skills in the subjects. The issue #4 of GMA TALK features a couple of articles written by those studying at KRISS sharing what they do and the way they enjoy their life at KRISS and Korea.

We are constantly looking ahead to where the needs of our customers are going, so that we can figure out how to better serve our customers. Valuable comments and advice were collected and transformed into new ideas that can refine and improve upon the practice of our service. As we are all aware, close partnerships can do better and more than one can do alone. It is my sincere wish that the new year will be overflowing with wisdom, health, wealth and love for each and every reader of GMA TALK. Be happy!

Yours sincerely,

Jongseon PARK, Ph.D.

Editor-in-Chief, Head of Measurement and Training Services



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STATISTICS: GMA 2016



Achievements of metrology HRD service for Foreign customers in 2016

81 people from 24 countries have enjoyed metrology HRD services offered by the GMA of KRISS.

46 people in Group courses

35 people for Individual courses

THANKS to the close cooperation and assistance rendered by our precious partners in metrology communities all over the globe, GMA was able to continue expanding its service of HRD in metrology in 2016. There were 81 customers from 24 countries who came to KRISS to join in different GMA courses offered this year. They enjoyed opportunities of technical study through the customer-focused group and individual programs designed by GMA.

AS regards the group courses, 46 people from 19 countries were gathered to learn the key subjects of metrology in

Chemistry (MiC), Metrology and Quality (MnQ), and Electricity and Magnetism (EM). Individual courses were open to receive 35 people including 25 students who are studying under the program of UST-KRISS graduate school of metrology.

BIPM, APMP and other RMOs, and NMIs including PTB of Germany have kindly shared effort and resources with KRISS, promoting the GMA's HRD services to create benefit for more people from the developing world. Walking along the next pages will take you to a better understanding of what GMA achieved this year in cooperation with our precious foreign partners.

| Group courses | Individual courses | Graduate studies | Total | Subjects covered |
|-----------------|--------------------|--------------------|-----------------|---|
| 46 Participants | 10 Participants | 25 In progress | 81 participants | Metrology in Chemistry (MiC), Metrology and Quality (MnQ), Electricity and Magnetism (EM), Thermometry, Gas Analysis, Acoustics, Vacuum, Ionizing Radiation |
| 19 Countries | 8 Countries | 7 Joined (in 2016) | 24 countries | |

STATISTICS: GMA 2016



Achievements of metrology HRD service for Local customers in 2016

To enhance measurement capabilities of industries including SMEs & calibration laboratories, and to spread measurement science deep into the classrooms of middle and high schools

236 people in
10 group courses
(ordinary program)

76 people for
13 individual courses
(tailored program)

25 science teachers
at the summer
metrology school

WHILE offering services for foreign customers, GMA also provides its metrology HRD services for local customers in Korea. In 2016, GMA received 337 Korean people with its 24 local programs that consist of ordinary group courses and tailored individual courses.

GMA's service of HRD in metrology puts growing emphasis on creating better values for customers from small and medium industries, in particular. It pursues to help them better enhance their measurement capabilities that will play an underpinning role in gaining their competitive edge in the global market. For

the sake of creating better value for our customers, GMA develops and employs new and substantial approaches that will lead to better performance in learning.

AS part of its effort to spread measurement science deep into the classrooms of middle and high schools, GMA organized 2016 Summer Metrology School for science teachers. Specifically designed for science teachers in the middle and high schools of Korea, the 2016 summer school accepted 25 teachers from 23 schools. Please refer to pages 14 and 15 that carry more details of what GMA has done for the local customers in 2016.

| Ordinary Group courses | Tailored Individual courses | Outreaching services (on-site) | Summer Metrology School for Science Teachers | Total |
|------------------------|-----------------------------|--------------------------------|--|-------------------|
| 236 Participants | 71 Participants | 5 Participants | 25 Participants | 337 participants |
| 108 organizations | 21 Organizations | 1 organization | 23 Middle/high schools | 153 organizations |

STATISTICS: GMA 2016



BENEFICIARIES OF GROUP COURSES

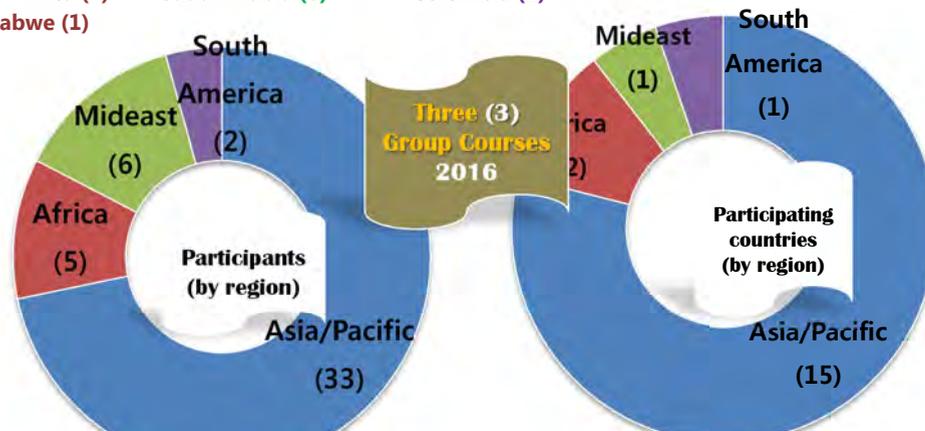
| Asia /Pacific | Africa | Mideast | South America | Total |
|---------------|--------|---------|---------------|------------------------|
| 15 | 2 | 1 | 1 | 19 countries |
| 33 | 5 | 6 | 2 | 46 participants |

- Bangladesh (2)
- Cambodia (2)
- China (5)
- Hong Kong (1)
- India (2)
- Indonesia (5)
- Kazakhstan (1)
- Korea (2)
- Malaysia (4)
- Myanmar (1)
- Mongolia (2)
- Pakistan (1)
- Papua New Guinea(1)
- Sri Lanka (3)
- Vietnam (1)

- South Africa (4)
- Zimbabwe (1)

Saudi Arabia (6)

Colombia (2)



GMA offered three (3) group courses in 2016. Under a selected theme of metrology for each course, there were 46 participants coming from 19 countries of Asia, Africa, Mideast, and South America. As was for the past three years, its beneficiaries were mostly from the developing countries of Asia.

THERE were four (4) new countries who added their names in the list of beneficiaries of the GMA metrology HRD services. They are **Myanmar, Papua New Guinea, India** and **Kazakhstan**.

THE the strategic partnership under the APMP/MEDEA project, GMA worked closely with APMP DEC and PTB of Germany. Thanks to the co-funding scheme of the partnership, 15 people from the APMP member economies enjoyed the financial support for their participation in the three group courses offered by GMA this year. GMA will endeavor to find new and more resources so that accommodate as many beneficiaries as possible from all over the globe.

SERVICE FOR FOREIGN CUSTOMERS

GROUP COURSES 2016



Three (3) group courses receiving 46 foreign participants in 2016; presenting technical subjects and strategic issues in metrology

Intensive laboratory sessions with lectures and hands-on exercises effectively combined

GMA offered three (3) group courses in 2016. It includes two (2) technical courses, covering the subjects of Metrology in Chemistry (MiC) and Metrology in Electricity and Magnetism (EM).

It is noteworthy that GMA has developed the MnQ course which presented strategic issues of metrology. Audience to the MnQ course mostly consisted of directors, heads of metrology laboratories and government officials who are in charge of management and making policies on their national measurement system. As they are in charge of management and making policies

in their national measurement system, the MnQ course pursues to share with them better understanding of the significant role of metrology that it plays in promoting the economic performance and the quality infrastructure of their countries.

SPEAKERS for the GMA group courses were invited both within and outside KRISS, including a CIPM member from Japan. There were 46 participants who came from 19 countries in different regions of Asia, Oceania, Africa, Mideast, and South America.

| GMA Courses 2016 | Subjects/Modules | Dates | Participants |
|------------------------------|---|---------------------------------|--------------|
| <u>GMA-GT-2016-01</u> MiC | Metrology in Chemistry | Mar 21-Apr 1, 2016 (2 weeks) | 20 |
| <u>GMA-GT-2016-02</u> MnQ | Metrology and Quality | Apr 25-29, 2016 (1 week) | 11 |
| <u>GMA-GT-2016-03</u> EM | Metrology for Electricity and Magnetism | Jun 13-24, 2015 (2 weeks) | 15 |

GROUP COURSES 2016: METROLOGY IN CHEMISTRY (MiC)



THE group course of **Metrology in Chemistry (MiC)** was held for the two weeks of March 21 – April 1, 2016. Different from the previous one offered in 2013, the MiC course of 2016 was presenting two selected topics of organic and inorganic analysis: the MiC course in 2013 was dealing with four modules of organic and inorganic analysis, gas analysis, and bioanalysis.

LIKE all GMA group courses, the intensive

laboratory sessions were closely combined with technical lectures and hands-on exercises in ways that participants could effectively obtain fundamental knowledge and basic skills required for offering quality services to their customers.

A group of 20 participants were gathered in the MiC course, whose level was set to be appropriate for beginners in the activities of metrology in chemistry. It was in response to

the needs of customers as confirmed by the APMP DEC and PTB.

THANKS to the co-funding partnership of GMA/KRISS (Korea) and the PTB (Germany), participants from the APMP member economies were provided with their international airline tickets, accommodations, and tuition fees. It is likely that such financial co-funding scheme will continue in 2017 as well.

| GMA_GT_2016-01-MiC Metrology in Chemistry | Subjects | Time slots allocated |
|---|--|----------------------|
| MiG Metrology in General | Overview of metrology in chemistry, QMS for ISO Guide 17025 & 34, Method Validation | 1 day |
| | ISO Guide 35, Certified Reference Materials, KC-CMC-Traceability | 1 day |
| | Measurement Uncertainty | 1 day |
| MiC Metrology in Chemistry | Presentation of Lab Reports by participants Special lecture and presentation of UST | 1 day |
| Technical visit | Visit to selected industries | 1 day |
| Cultural experience | Historic sites and attractions in Seoul | 1 day (weekend) |
| Intensive Laboratory Session (ILS): lectures and hands-on exercises effectively combined | | |
| Module-1 (OA) | Organic Analysis | 2 days |
| Module-2 (IA) | Inorganic Analysis | 2 days |
| Wrap-up | Performance Evaluation Test, Individual lab visits, Course Evaluation, Closing session | 1 day |



Dreaming future with fantasy
in SIM,
SAMSUNG Innovation Museum,



"Sa-Rang-Hae-Yo," Korean group singing "I love you!"

GROUP COURSES 2016: METROLOGY AND QUALITY (MNQ)



THE MnQ course was organized for the target audience of QMS managers, heads of metrology laboratories, and directors of NMIs. The course programs was strategically designed for sharing Korea's experiences in advancing its capabilities of scientific metrology, conformity assessment and legal metrology, and standardization.

THE one-week course (April 25-29, 2016) features its coverage of the key issues of strategic interest to metrology community. It ranges from the QMS requirements and practices, KC-CMNC-traceability, uncertainty in measurement, SI and fundamental constants, SRD activities to the impact of

metrology and the CIPM MRA and the evolving needs of metrology. Speakers were invited not only from within KRISS but also from outside KRISS including the local metrology community of Korea. Dr. Takashi Usuda from NMIJ of Japan was kind enough to come to speak about the economic impact of metrology and the CIPM MRA.

POSTER sessions allowed them to share ideas and experiences of how and what to do to further raise awareness of the activities and significant roles of participating NMIs and metrology.

| GMA_GT_2016-02-MnQ Metrology and Quality | Subjects | Time slots allocated |
|---|---|----------------------|
| Module-1 | S&T Innovation and NQI in Korea | 1 day |
| Module-2 | CIPM MRA and Quality Management System | 1 days |
| Module-3 | SI and Uncertainty | 1 day |
| Module-4 | Impact and Evolving Needs of Metrology Lab Tour | 1 day |
| Wrap-up | Evaluation of the Course, Technical Visit to Industry | 1 day |
| | Cultural Experience in Seoul | 1 day (weekend) |



Playing "uncertainty" with Dr. CHOI, ... "measurement begins with traceability and ends with uncertainty"



S&T innovation in Korea and roles of standards



GROUP COURSES 2016: ELECTRICITY AND MAGNETISM (EM)



THE subject of electricity and magnetism (EM) serves as one of the priority measurement fields. Its measurement capacity should be made available from the early stage of industrialization. As industry advances, needs for EM measurement services grow bigger across wide sectors of industry.

DESIGNED to be appropriate for intermediate level of metrologist, the EM course was addressing the concepts of the traceability and measurement standards along with practical calibration skills in the key subjects of EM metrology. Lectures and hands-on exercises were presented in four (4) modules,

covering DV/AC voltage and power, resistance and impedance, high voltage and high power, and magnetic field.

THERE were 15 participants at the EM course, coming from different regions of Asia, Africa, Mideast, and South America. Like all other group courses of GMA, the EM course was preceded with a session of metrology in general, (MiG). The two-day MiG session is unique to the GMA group courses as it allows them to learn more about fundamental subjects of metrology such as NQI, QMS, CIPM MRA, KC-CMC, traceability and uncertainty in measurement.

| GMA_GT_2016-03-EM Electricity and Magnetism | Subjects | Time slots allocated |
|---|--|----------------------|
| MiG | NQI, QMS, KC-CMC-Traceability | 1 day |
| Metrology in General | Measurement Uncertainty | 1 day |
| Intensive Laboratory Session (ILS): lectures and hands-on exercises effectively combined | | |
| Module-1 | DC/AC Voltage and Power | 2 days |
| Technical visit | Visit to selected industries | 1 day |
| Cultural experience | Historic sites and attractions in Seoul | 1 day (weekend) |
| Module-2 | Resistance and Impedance | 1 day |
| Module-3 | High Voltage and High Current | 1 day |
| Module-4 | Magnetic Field | 1 day |
| Wrap-up | Evaluation test, Individual lab visits, Action plan development and presentation | 1 day |
| Evaluation and Closing | Course Evaluation, Closing Session | 1 day |



Ladies dressed in traditional costumes, singing "let it go" in the farewell dinner



Happy birthday to uuuu!

GROUP COURSES 2016 PHOTOS



Hands-on: MiC



Opening of MiC course



High voltage, Power



Opening of EM course



Farewell dinner: MnQ



Dr. Takashi Usuda (CIPM Member) presenting the economic impact of the CIPM MRA



Poster presentation by participants (MnQ course), sharing ideas and experience of awareness raising

INDIVIDUAL COURSES 2016



Tailored to meet the specific needs of customers

Orientation to be a metrologist

Building up new CMCs

Establishment of measurement standards

Co-operative education

COMPARED with GMA's group courses which are a sort of ready-made programs, the individual courses of GMA have been developed at the request of its customers. Its programs have accordingly been customized in order to meet the specific needs of the customers.

INDIVIDUAL courses serve customers for their different purposes such as getting orientation to be a professional metrologist, building up new calibration and measurement capabilities, conducting collaborative

research and co-operative education and experiments for dissertation. **BY** the end of October 2016, GMA accepted nine (9) customers for their individual studies at KRISS, whose subjects range from fundamental metrology to cutting-edge measurement technology. One more individual program will be offered in December for a customer from BATAN, Indonesia in the field of ionizing radiation funded by the IAEA.

| Areas (number of participants) | Countries | Employers | Dates |
|------------------------------------|----------------------|---|--------------------------------------|
| Thermometry (1) | South Africa | National Metrology Institute of South Africa (NMISA) | Jan 21 – Mar 17, 2016 (8 weeks) |
| Gas analysis (2) | South Africa | National Metrology Institute of South Africa (NMISA) | Apr 1 – 15, 2016 (2 weeks) |
| Acoustics (1) | Kenya | Kenya Bureau of Standards (KEBS) | Jul 2 – 16, 2016 (2 weeks) |
| Vacuum (1) | Pakistan | National Institute of Vacuum Science and Technology (NINVAST) | Jul 12 – Aug 10, 2016 (8.5 weeks) |
| Gas Analysis (1) | Chinese Taipei | Center for Measurement Standards (CMS) | Aug 1 – Sept 2, 2016 (5 weeks) |
| Gas Analysis (2) | Malaysia Thailand | National Metrology Institute of Malaysia (NMIM) National Institute of Metrology, Thailand (NIMT) | Aug 15 – Oct 1, 2016 (7 weeks) |
| Ionizing Radiation (1) | Indonesia | National Atomic Energy Agency (BATAN) | Dec 2 – 29, 2016 (4 weeks) * TBC |
| Quantum measurement science (1) | Canada | University of Waterloo | Jan 1 – Apr 30, 2016 (17 weeks) |

KRISS-UST GRADUATE SCHOOL OF METROLOGY



Dr. Tamer Abd-Elhakeem
(NIS, Egypt), 2016



Dr. James Tshilongo,
(NMISA, South Africa), 2015



Mr. Agung Augsbudiman
(BATAN, Indonesia), 2016

Mr. Helmi Zaini
(LIPI, Indonesia), 2016



Dr. Suherlan Abu Hanifa
(LIPI, Indonesia), 2015



Ms. Maryness Slalzar
(NML/ITDI, Philippines, 2016)

| 2006 – Oct 2016 | Doctoral course | Master's course | Total | Remarks |
|--------------------|-----------------|-----------------|-----------|--|
| In progress | 15 | 10 | 25 | 18 admitted in 2015-2016 |
| Graduates | 12 | 12 | 24 | Leading role as Division director, Laboratory head, University professor, Adviser to S&T Minister |
| Total | 27 | 22 | 49 | |

KRISS-UST Graduate School of Metrology offers a joint degree programs in metrology and related science and technology. UST, the University of Science and Technology of Korea is unique in its operation al scheme and financial resources. The graduate school was founded in 2002 to cultivate creative talents who will lead the future core and industrial technology development. The graduate school features its educational programs that place a great emphasis on customized education system with multidisciplinary curricula, on-the-job training in advanced R&D institutes, and the tutorial system, attracting growing number of students from all over the globe,

UST has been jointly operated with the participation of 32 government-funded research institutes of Korea, who offer excellent environment for graduate studies in a wide range of science, technology and engineering. As of September 2016, there are 25 students at KRISS, including 18 admitted for recent two years, who have been studying on the subjects of fundamental and cutting-edge areas of metrology.

FOR information about the KRISS-UST graduate school of metrology, please visit www.ust.ac.kr; and grab a chance to develop yourself to be future leaders in the metrology community.

SERVICE FOR LOCAL CUSTOMERS 2016



ONE of the priority missions common to almost all of national metrology institutes should among others be to disseminate what they have achieved in their measurement laboratories to create values and benefits for the general public. Different tools are available to deliver their achievements to their customers, such as calibration and testing services, supplying certified reference materials, technology transfer and commercialization, and technical training services of which GMA is in charge at KRISS.

THE metrology HRD service of KRISS began with training for the technical staff of calibration and testing laboratories in Korea. Industrial advancement calls for higher level of measurement capabilities. GMA's metrology HRD services has

been evolved to meet ever growing demands of reliability in measurement on global level that can only be provided by competent measurement experts. GMA's metrology HRD services for its local customers address subjects of cutting-edge measurement technologies such as materials characterization, surface analysis, dosimetry and radioactivity measurement, NDE, gas analysis, etc. Upon request of customers, tailored courses are also offered. More than 70 people were given 13 individual courses in 2016 where they could find solutions to the measurement problems they were faced on site.

TO help industry and its customers to better improve their competitiveness in the global marketplaces, **GMA** is and will be making every effort to improve the quality of its HRD services.

| Courses | Number of courses offered | Number of participants |
|-----------------------------------|---------------------------|---------------------------------|
| Regular group courses | 10 courses | 236 (from 108 organizations) |
| Tailored individual courses | 12 courses | 71 (from 21 organizations) |
| Outreaching services (on-site) | 1 course | 5 (from 1 organization) |



SUMMER METROLOGY SCHOOL FOR SCIENCE TEACHERS IN KOREA 2016



HAVE you heard about STEAM education in Korea? It stands for promoting education of Science, Technology, Engineering, Arts, Mathematics for the young Korean generations.

IT is very well known that Science and Technology served as one of the critical factors that could make it

possible for Korea to achieve such a rapid economic progress over decades. It was no other than people, the human resources that were the key to success! To be more exact, it was professional human resources in science and technology who served as the core driving force of the economic growth of Korea.

Summer Metrology School shared effort for bringing Science, Technology, Engineering, Arts, Mathematics deep into the classrooms of middle and high schools .

LIKE the previous ones, the metrology school in 2016 was presenting the seven SI base units. GMA wanted to provide the participants teachers with a better understanding of “Why Metrology and NMI?” To this end, each class was composed of lecture followed by visits to the laboratories concerned.

THE first session began with a couple of lectures

delivering them the basic knowledge of measurement and its value to our daily lives, and a lecture on the SI units.

EACH of the rest sessions offered for the three days presented the teachers the seven SI base units one by one: length, mass, luminous intensity, thermometry, time, metrology in chemistry. The three-day metrology school in 2016 was operated with 25 teachers from 23 schools. (3)



RECENT surveys report of significant changes in the occupation preference of the Korean young generations. There are less number of students who want to study STEAM in university. Ideas and suggestions were proposed to shift the trends as it should bring negative impact on the sustainable advancement of Korea.

ONE of the action programs KRISS has taken to join effort

to shift the trends was to organize a metrology course for science teachers in the middle and high schools in Korea. It is the Summer Metrology School for Science Teachers, which has annually been held at KRISS every summer vacation. It intends to bring measurement science and technology deep into the classrooms of middle and high schools.

(2)



2016 Summer Metrology School for Science Teachers in Korea

| | |
|--------------|---|
| Day 1 | <ul style="list-style-type: none"> • Measurement and standards • SI • Length metrology (lab session included) |
| Day 2 | <ul style="list-style-type: none"> • Light and color (lab session included) • Mass standards (lab session included) • How to measure temperatures! (lab session included) • Evolving needs of metrology in chemistry (lab session included) |
| Day 3 | <ul style="list-style-type: none"> • Quantum Standards for Electricity (lab session included) • Time for advanced science (lab session included) |

MUCH satisfied with the summer metrology school in general, however, the participating teachers expressed a strong wish for further improvement the program contents. Teachers were asking for something more substantial they can

bring back to their students. **GMA** is looking for advice and comments on how to make it further refined until metrology seeds could be in full blossom in science classes in middle and high schools. (end)

GMA'S EXPANDED PARTNERSHIP WITH APMP AND PTB

GMA working closely with APMP and PTB through MEDEA Project and beyond (2015-)

GMA has been working closely with APMP and PTB with the MEDEA project: Measurement, Enabling Developing Economies in Asia. For the past couple of years, GMA received 34 people from the APMP member economies who were funded by the MEDEA and GMA. GMA's five group courses accepted 32 people, while two people came to an individual course. Tables below show brief statistics of who were the beneficiaries of the strategic partnership between

GMA/KRISS-APMP-PTB. **THE** partnership has agreed to continue to provide support for participants in the three group courses to be offered by GMA in 2017, namely, MRQ (Mass and Related Quantities), LDM (Length and Dimensional Metrology), and TH (Thermometry and Humidity). It is anticipated that the strategic partnership will be extended for the years to come.

34 people from 13 APMP member economies attended the GMA metrology HRD courses in 2015-2016 with the co-funding partnership of APMP-PTB and KRISS

| Year | Number of Beneficiaries | | Total |
|--------------|---------------------------|-------------------------|---------------------------|
| | Group courses | Individual courses | |
| 2015 | 17 (MiG, FMC, IR) | 0 | 17 |
| 2016 | 15 (MiC, EM) | 2 (MiC) | 17 |
| Total | 32 (12 members) | 2 (2 members) | 34 (13 members) |

| GMA Group courses | Member economy | Institute | Number of beneficiaries | Total |
|-------------------|-----------------------------|-----------|-------------------------|-----------|
| MiG | Indonesia | RCM-LIPI | 2 | 2 |
| | Bangladesh | BSTI | 2 | |
| FMC | Cambodia | NMC | 2 | 8 |
| | Mongolia | MASM | 2 | |
| | Sri Lanka | MUSSD | 1 | |
| | Vietnam | VMI | 1 | |
| | Cambodia | NMC | 2 | |
| IR | China | NIM | 1 | 7 |
| | Indonesia | BATAN | 2 | |
| | Malaysia | MNA | 1 | |
| | Vietnam | INST | 1 | |
| | | | | |
| Total | 8 members economies | | | 17 |
| MiC | Cambodia | NMC | 1 | 7 |
| | Indonesia | RCC-LIPI | 1 | |
| | Malaysia | NMIM | 1 | |
| | Mongolia | MASM | 1 | |
| | Myanmar | DRI | 1 | |
| | PNG | NARI | 1 | |
| | Sri Lanka | MUSSD | 1 | |
| EM | Bangladesh | NML-BSTI | 1 | 8 |
| | India | NPLI | 1 | |
| | Indonesia | RCM-LIPI | 1 | |
| | Kazakhstan | KazInMetr | 1 | |
| | Malaysia | NMIM | 2 | |
| | Pakistan | NPSL | 1 | |
| Vietnam | VMI | 1 | | |
| Total | 12 members economies | | | 15 |

GMA GROUP COURSES 2017



GLOBAL Metrology Academy (GMA) of KRISs is going to offer three (3) group courses in 2017. The first one is scheduled to take place for the two weeks of March 20 – March 31, 2017 covering the key subjects of Mass and Related Quantities (MRQ). In addition, we are pleased to be ready to offer a couple of courses of Length and Dimensional Metrology (LDM), and Thermometry and Humidity (TH) in May and August, respectively.

ANNOUNCEMENT and call for applications have already been sent out to be available on the websites of the global and regional metrology communities such as the

BIPM/DCMAS, AFRIMETS, APMP, COOMET, and SIM. The course programs have been drawn up to be appropriate for the intermediate level of each subject field.

WITH the view to creating better performance of learning for our customers, GMA makes every effort to develop its programs to be quite well balanced with theoretical lectures and hands-on exercises. Much more than appreciated would be your comments and advice that will be put together for further refining the GMA programs in every detail.

| Courses | Subjects/Modules | Dates | Applications (by) |
|-----------------------|--|--------------------------|-------------------|
| GMA-GT-2017-01 MRQ | Mass and Related Quantities Mass, Density, Force and Torque | Mar 20 – 31, 2017 | Jan 20, 2017 |
| GMA-GT-2017-02 LDM | Length and Dimensional Metrology Angle, Gauge Blocks, Length Measuring Instruments, Laser Dimensional metrology | May 22 – June 2, 2017 | Mar 17, 2017 |
| GMA-GT-2017-03 TH | Thermometry and Humidity SPRT Thermometry, Thermocouple Thermometry, Humidity, Moisture | Aug 21 – Sept 1, 2017 | Jun 16, 2017 |

[Course overview and application form](#) have been made public.

For inquiry regarding the GMA courses, please contact:

Sangwook Seo at swseo@kriss.re.kr.

IMPRESSIONS OF KRISS AND GMA (1)

“ WHAT THEY ARE SAYING ABOUT KRISS AND GMA ”



There was a Canadian student at KRISS, Korea. He was given an opportunity to broaden his workplace experience by participating in two co-operative work terms at the Center for Quantum Measurement Science of KRISS. While his staying at KRISS for eight months by the end of April 2016, he has not only spent his time on building up knowledge but enjoyed

experiencing new things through visiting various places in KOREA.

He recommends the GMA to anyone who wants to gain advanced knowledge in measurement sciences and experimental physics and to learn about the fantastic country of Korea as well.

**CO-OPERATIVE
EDUCATION**
for
a Canadian
undergraduate
student



From Jacob Koenig

I am a student from the University of Waterloo in Canada. During the course of my undergraduate degree in physics, I am given the opportunity to arrange five co-operative work terms where I gain workplace experience in my area of study. I am completing two consecutive work terms for a total of eight months with the Global Metrology Academy (GMA).

GMA has been extremely gracious

and accommodating in bringing me to KRISS and ensuring that my time in Korea is enjoyable. Everyone I have interacted with at the GMA and KRISS have been very kind and insightful individuals who have greatly enriched my experience in Korea.

AS this was my first time visiting Korea, I expected the adjustment to an entirely new culture and language to be very difficult. Luckily, any time

that I have had challenges or uncertainties, I have had the support of the GMA and KRISS.

THE research that I am doing in the Center for Quantum Measurement Science is tremendously new and exciting to me. I learn about interesting concepts and gain insight into a unique and exciting field each and every day.

IMPRESSIONS OF KRISS AND GMA (2)

“ WHAT THEY ARE SAYING ABOUT KRISS AND GMA ”



From Jacob Koenig (continued)

WHILE I have certainly gained a great amount of knowledge pertaining to metrology and experimental physics while at KRISS, I have learned an equal amount about Korean culture, art, food, language, and history. I have spent many weekends exploring Daejeon as well as visiting other cities in Korea, such as Seoul, Gyeongju, and Busan.

I have been studying the Korean

language in my spare time and reading about Korean history from the time of “Samguk-sidae” to the modern day. I have visited many parks, mountains, history museums, and art galleries during my time at KRISS and have gained a fond appreciation and respect for the beauty of Korea.

MY time here at KRISS has been a wonderful experience, none of which would have been possible

without the education and generosity of the GMA and KRISS. I am certain that the experience and knowledge that I have gained here will be extremely helpful in my future career.

I highly recommend participating in a GMA course to anyone interested in learning about the world of measurement science and this fantastic country.”



THOUGHTS ON KRISS AND GMA (1)

“ WHAT THEY ARE SAYING ABOUT KRISS AND GMA ”

A Married Couple Studying at KRISS

Ms. Monalisa Ragay-Enot and Mr. Manrusces Flores Enot are a couple who receive a full scholarship supported by KRISS. They have been studying at KRISS since 2015 not long after they got married. It was Monalisa who first left her home country to study at the KRISS-UST graduate school of metrology starting in the spring semester. She thought that it would be great if the couple gains a chance

to study together in KOREA. She encouraged her husband to follow her, and he applied and was also admitted to join the master's course in the fall semester of 2015.

Please enjoy the story of the first foreign couple who are enjoying their studying and living at the KRISS-UST graduate school of metrology.



From Ms. Monalisa Ragay-Enot

IT all started in year 2010, a scholarship was offered by the Thermometry Center of Korea Research Institute of Standards and Science (KRISS) for me to study at the University of Science and Technology (UST) in Daejeon, Korea, for a master's degree program in metrology. But another blessing also unfolded that year. It was the year that we got married. We were so looking forward to starting a family that I had to forego the scholarship.

MOVING forward to 2014, the same scholarship was offered again. Though I was ready to grab it, it was a very hard decision to make because it would be difficult for me and my husband to meet often because he would be required a visa to visit me here in Korea. Nevertheless, I took the offer and enrolled for Spring Semester 2015 with the assurance from my husband that he will follow me once I am in Korea.

I have always been amazed by KRISS research facilities and once I was here I knew I have made the right decision to advance my career in Metrology. I was very fortunate to have a very supportive and kind professor. Not long after, a scholarship grant was also made available for my husband. It was autumn of 2015 when hubby got here in Korea.

ALL the days we long for each other was remedied because this time hubby and I work together in the same building and we were even given cubicles in the same office. Ever since that day, hubby and I really enjoyed our time together; in the morning we go to school together, have lunch together at KRISS cafeteria and go home in the evening together. As a way to relax our minds, hubby and I loved to unwind by taking a walk beneath the colorful autumn trees that lined the roads at KRISS. We enjoyed the simple thrill of snow falling and the beautiful feeling of walking on snow in wintertime

THOUGHTS ON KRISS AND GMA (1)

“ WHAT THEY ARE SAYING ABOUT KRISS AND GMA ”

A Married Couple Studying at KRISS (continued)

WHILE here at KRISS, we were given opportunities to attend various seminars and workshops. We even had the opportunity to meet notable persons especially Prof. Klaus von Klitzing, Nobel laureate in physics, for his discovery of the Quantum Hall Effect, who happened to be a speaker during the International Metrology Symposium 2015 held at KRISS.

OVER the past months we have grown close to some KRISS employees as well as other student-scholars from other countries and our friendship was forged. We are very fortunate to have known them as they were not only our friends but our mentors as well. Oftentimes, we would dine out together and try on different Korean food. Among our favorites are “kalbitang” (beef short rib soup), “bossam” (Korean boiled pork wrap) and of course kimchi (the most common Korean side dish consisting of

fermented vegetables, usually cabbage, with a variety of seasonings). We were also very fortunate to experience digging sweet potatoes and harvesting persimmon fruit for the first time. On special occasions, we would spend sleepless nights singing our hearts out in our favorite “noraebang” (Korean term for singing room).

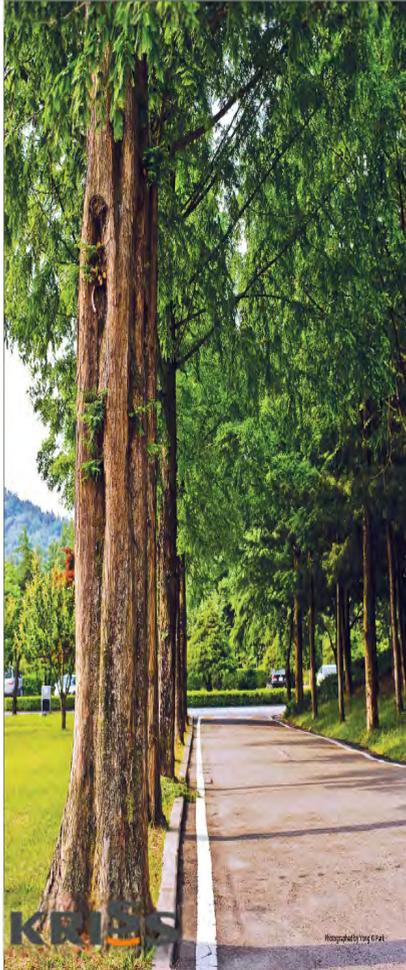
SO far it has been an enjoyable and challenging experience here at KRISS. With the facilities provided by KRISS and the research topics and experiments assigned by professors, day by day, a new door of knowledge is opened. With perseverance and hard work, we shall continue to strive to achieve our goal.



From Ms. Monalisa Ragay-Enot



GMA AT A GLANCE



Vision

- To be the global center of excellence for metrology HRD

Function

- To develop programs of metrology HRD
- To operate education/training courses in metrology
- To promote ODA in metrology for the developing world

Mission

- To foster competent human resources in metrology

Launched in December 2012, **GMA** has been assigned with a mission of cultivating professional human resources required by customers over wide sectors of metrology community. With its target audience both from local and foreign metrology laboratories, GMA develops and operates education and training programs covering a variety of key subjects in metrology. In pursuit of better performance in delivering quality programs meeting the practical needs of customers, GMA has been making its very best efforts towards a vision to be the global center of excellence for HRD in metrology.

PORTFOLIO OF GMA PROGRAMS



Courses at KRISS

Group, Individual

- **Group courses**
 - Duration: Two-week intensive programs
 - Covering fundamental subjects of metrology
 - Lectures combined with hands-on practice
- **Individual courses**
 - Duration: Two weeks to one year
 - Tailored to meet the specific needs of customers

Outreach Services - on site of customers

Comprehensive approach

- **A group of metrologists of KRISS visiting customers on site**
 - Offering on-site technical advice, training and lectures
- Capability evaluation, offering recommendations of action plans
- Advice on strategic planning of national standards system, etc.

Graduate Courses

Master's, Doctoral

- **UST-KRISS Graduate School of Metrology (www.ust.ac.kr)**
 - For master's and doctoral degrees
 - Funded by KRISS

MODULES AVAILABLE



27 modules

- 25 technical modules covering key subjects in metrology
- 2 module concerning MiG (Metrology in general)

Technical
modules

| Area | Modules | Area | Modules |
|-----------|---------|-----------|---------|
| AUV | 2 | PR | 3 |
| EM | 5 | QM | 3 |
| L | 1 | RI | 3 |
| MM | 2 | T | 2 |
| MRQ | 3 | TF | 1 |

Metrology in
General

National standards system, economic impact of metrology,
QMS, Traceability and uncertainty in measurement

OUTREACH SERVICES TO BE PROMOTED

Since it was launched in December 2012, GMA has been offering HRD programs of metrology at the laboratories of KRISS in Korea. As an effort to further widen the horizon of its services and for the sake of better benefits of our customers, GMA has added a new item to its service portfolio. It is the outreach service that is to be offered on site of our customers. Upon request of customers, GMA is ready to offer services on site of customers

abroad. The competitive advantages that customers could enjoy with our outreach services include its wide coverage of services among others. The GMA programs offered at KRISS are primarily focused on addressing technical capability of the customers. Meanwhile, the outreach services could take a more comprehensive approach, ranging from diagnosis to prescriptions, dealing with not only technical but also strategic issues to which the customers expect to

find solutions. Activities of the outreach services therefore consist of fact-finding survey, lectures, training and technical advice. Furthermore, beneficiaries of the outreach service will not merely remain with a few but spread widely over the national metrology community of the customers.

For any inquiry of the outreach service of GMA, please send your inquiry to Mr. Sangwook Seo of GMA at swseo@kriss.re.kr.

Competitive Advantages of Outreach Services of KRISS GMA

Comprehensive Approach

From Diagnosis
To Prescriptions

Diverse Services

Fact-finding Survey
Lectures and advice
Technical Training

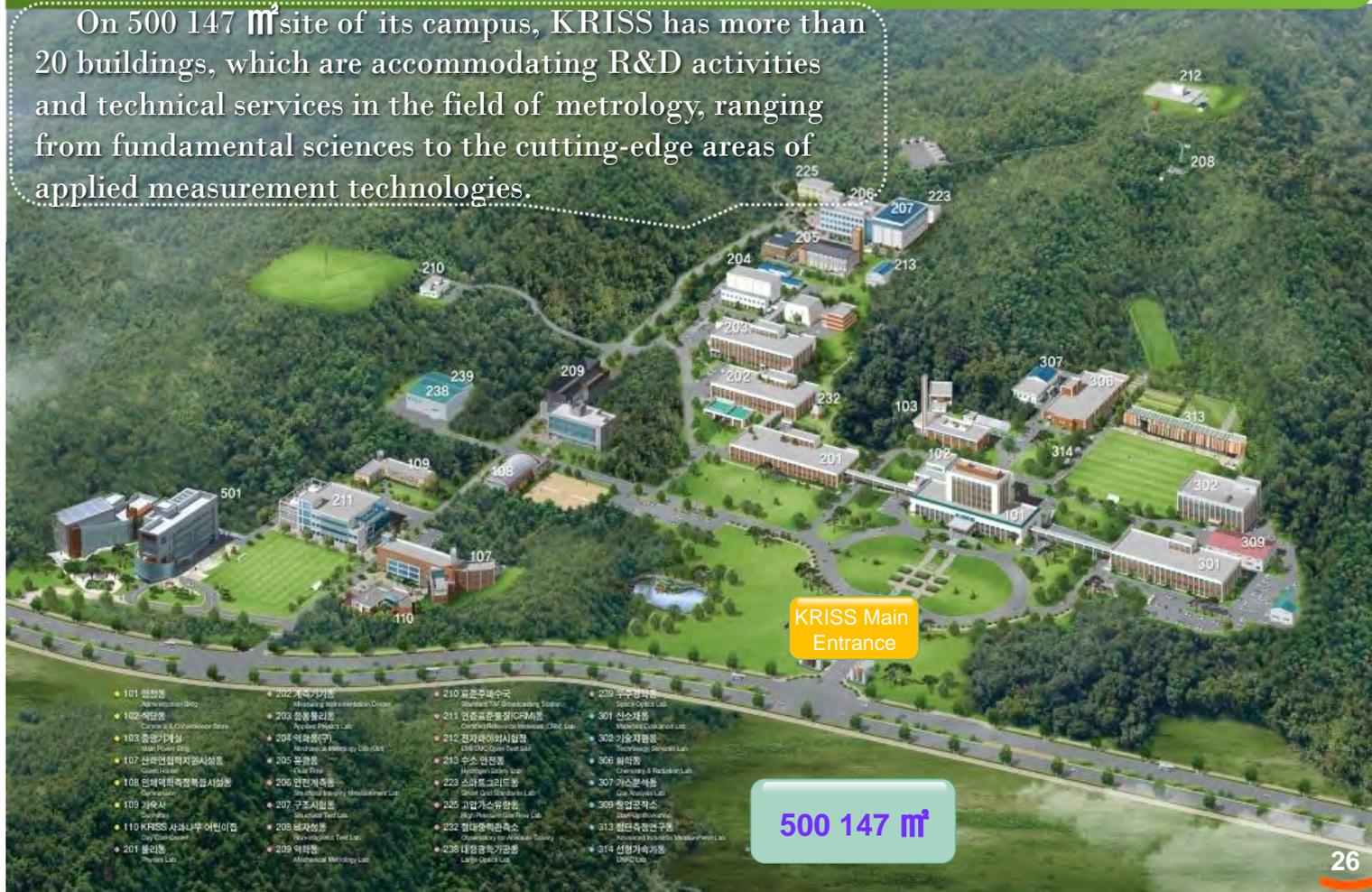
Wide Range of Beneficiaries

Nationwide Community
of Metrology
NMI, Calibration/Testing
Labs, Government, etc.

MAP OF KRISS CAMPUS



On 500 147 m² site of its campus, KRISS has more than 20 buildings, which are accommodating R&D activities and technical services in the field of metrology, ranging from fundamental sciences to the cutting-edge areas of applied measurement technologies.



KRISS Main Entrance

500 147 m²

- 101. 배양실
Incubation Room
- 102. 에듀캠
Camera & Coprocessor Store
- 103. 중앙기체실
Main Power Room
- 107. 산학협업대학자형시험실
Coop. Lab.
- 108. 인쇄역학특정물성시험실
Capitulation
- 109. 기체사
Gas Refill
- 110. KRISS 시공나무 어원어업
City Clean Center
- 201. 물리실
Physics Lab.
- 202. 계측기개발
Measurement Instrumentation Center
- 203. 표준물리실
Applied Physics Lab.
- 204. 역학연구
Mechanical Metrology Lab. (KRISS)
- 205. 표준물리실
Traceable
- 206. 양전계측용
Electromagnetic Compatibility Measurement Lab.
- 207. 구조시험실
Structural Test Lab.
- 208. 열차성능
Thermodynamic Test Lab.
- 209. 역학실
Mechanical Metrology Lab.
- 210. 표준추진수극
Standard Prop. Propulsion System
- 211. 원중량표준연구(CRM)실
Coordin. Metrology Research (CRM) Lab.
- 212. 전자역학시험실
EMC/EMC/EMC Test Lab.
- 213. 수조-연결실
Hydrogen Gas Test Lab.
- 223. 소파용 크리드룸
Small Gas Storage Lab.
- 225. 고급가스유량계
High Precision Gas Flow Lab.
- 232. 열대생물학연구소
Observatory for Airborne Ecology
- 238. 대량공정기공실
Large-Scale Lab.
- 239. 우주정밀도
Space Optics Lab.
- 301. 산소저장
Respiration Gas Storage Lab.
- 302. 기술지원실
Metrology Support Lab.
- 306. 역학실
Dynamics & Positioning Lab.
- 307. 가스분석실
Gas Analysis Lab.
- 309. 열입공역소
Heat Treatment
- 313. 원자핵정량연구실
Nuclear Analysis Measurement Lab.
- 314. 선형가속기용
LINAC Lab.



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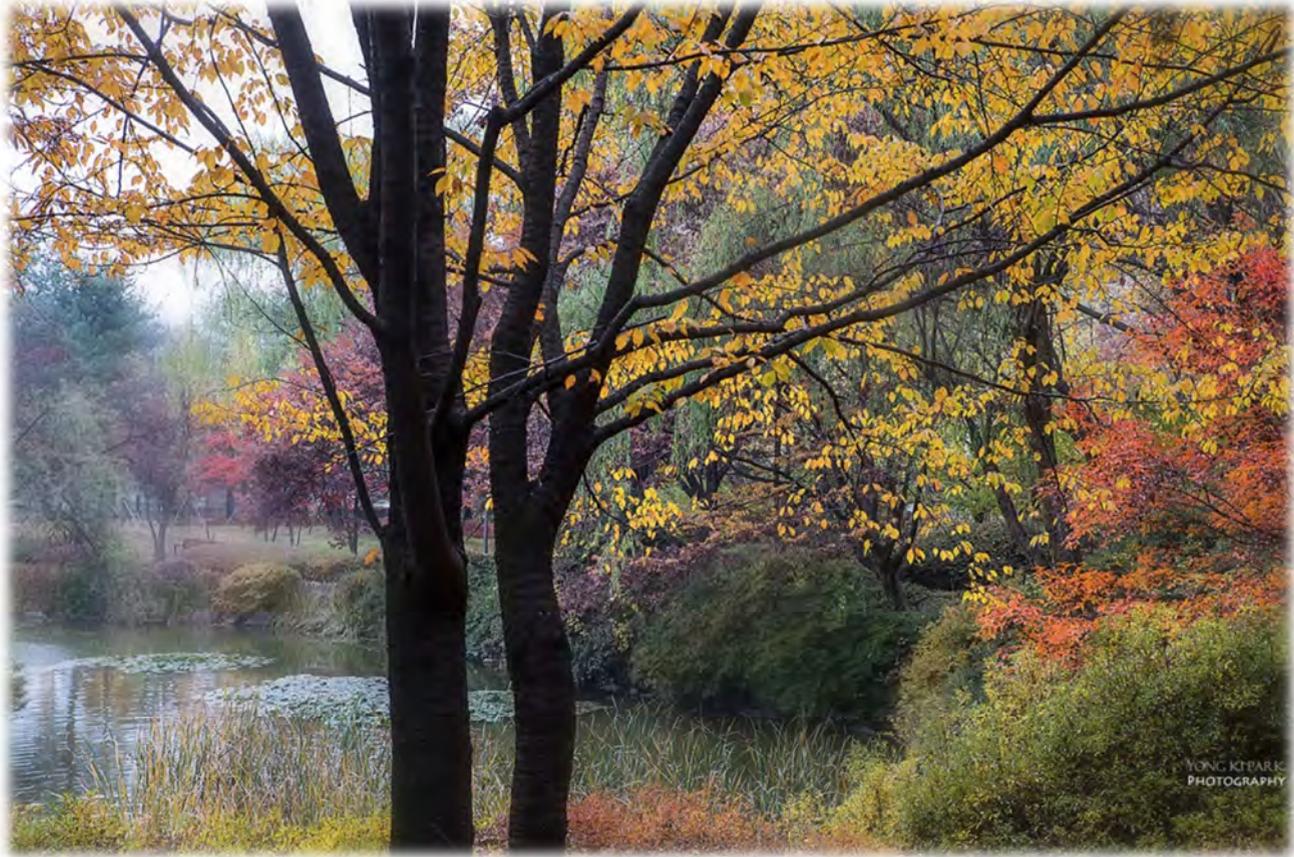
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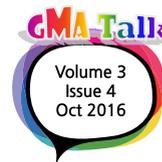
KRISS

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*GMA pursues to be a most
Friendly and productive partner
in human resources development in metrology*



GMA

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