SEOUL ICM 2014
INTERNATIONAL CONGRESS OF MATHEMATICIANS

Math&Presso

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Greetings from the president of the Korean Mathematical Society

ICM can spur advancement in developing nations

The Seoul International Congress of Mathematicians 2014 has just begun after a long period of preparation and anticipation. As the president of the Korean Mathematical Society, I would like to welcome all of you who have come to participate in the Seoul ICM and congratulate all the award winners, plenary speakers, and invited speakers.

Immediately upon the selection of Korea five years ago as the host of ICM 2014, our society began preparing for the event under the direction of the Local Organizing Committee. I must first express my gratitude to all the members of the committee for their incredible efforts.

In addition to our collaborative partnership with the International Mathematical Union, SEOUL ICM 2014 would not have been possible without the generous support from the Ministry of Science, ICT & Future Planning, the National Assembly, and our corporate sponsors. I would also like to thank President Park Geun-hye for personally handing out the Fields Medals during the opening ceremony. Thanks also go to our other distinguished guests and, of course, my fellow members of KMS, without whose support and encouragement this congress would not have been possible.

Myung-Hwan Kim
President of the Korean Mathematical Society

It is a minor miracle that Korea is hosting this year's ICM. But I think the real miracle is that Korean mathematics has grown and matured so much and so quickly in the past 40 years that it is now at a level for us to host this event. When I was a college student in the mid-1970s, there were fewer than 10 mathematicians with doctoral degrees in Korea, and publishing a paper in an international journal made news. After 40 years, we have now about 2,000 mathematicians with doctoral degrees and we publish almost 1,000 papers per year. We are very proud of this progress, but recognize also that we are still far from our ultimate goal. We should consider the SEOUL ICM 2014 not just a singular event but as a launching pad for further progress. The Korean Government has officially designated 2014 as the Year of Mathematics, and KMS will continue to work diligently for the advancement of mathematics in Korea.

During the SEOUL ICM 2014, we are also committed to sharing with developing nations our experience in strengthening the Korean mathematics community. We believe mathematics is the core foundation for enriching the life of humanity, and we hope to transform our message of "mathematics for everyone" into a systematic and global movement.

With the advancement of digital technology, mathematics has become extremely important in many areas of our contemporary society, improving our daily lives with small conveniences and with state-of-the-art industrial technologies. Convincing evidence has accumulated that mathematics is a discipline of power as well as of beauty. Many excellent students in Korea today seek to study mathematics instead of the always-popular medicine or engineering fields. We have the important task and noble duty of guiding these students toward a bright future; it is our responsibility to show them the far-reaching beauty and power of mathematics.

I sincerely hope that as we share our thoughts and insights during this year's ICM, every one of you may encounter serendipitous clues for finding your own answers to the many challenges we confront.

But of course, do not forget to save enough time for exploring and enjoying Korea's delectable foods, delightful culture, and warm hospitality during your stay in Seoul.

Participants at the official proclamation ceremony to declare the year 2014 as the "Year of Mathematics" pose for a photo on Jan. 13. From left to right: President JongHae Keum of KIAS, President Myung-Hwan Kim of KMS, former Minister of Science, ICT and Future Planning Mun-kee Choi, former Minister of Education Nam-soo Seo, President Hye-Ryun Kang of KOFAC, Chairman Hyungju Park of the SEOUL ICM 2014 Organizing Committee, and President Dongsu Kim of NIMS.

Women mathematicians conclude 1st congress with banquet at COEX

About 200 women mathematicians enjoy an evening of networking at a banquet yesterday to close the first official International Congress of Women Mathematicians at the Grand Ballroom of COEX. The congress, under the slogan "Together," opened Tuesday at Ewha Womans University. The second day of the program was held yesterday at COEX; the gap in the program permitted participants to attend Wednesday's SEOUL ICM 2014 events.

Speakers at the networking banquet summed up their two days of activities: five colloquium-style talks by leading women mathematicians and talks at a poster session highlighting the latest research of women mathematicians on the first day and two additional invited lectures yesterday. The group also participated in the Korean Women in Mathematical Sciences and IMU special program sessions and attended the 2014 Emmy Noether Lecture.

NANUM Networking

‘Meet and greet’ receptions foster NANUM spirit

Scores of people were chatting, some exchanging name cards, in Room 403 at COEX on Wednesday evening. It was the first day of a three-day NANUM Networking meeting for the SEOUL ICM 2014. The first evening was dedicated to Latin American mathematics. Most of the attendees were from that region, but others were mathematicians or officials of foreign aid agencies from developed countries who were looking for ways to help foster the growth of mathematics there.

Herbert Clemens, a secretary of the International Mathematical Union’s Committee for Developing Countries, discussed several initiatives launched recently in Latin America to help young students in the region.

“I think in Latin America there are powerful centers of support for other parts of the region,” he told the audience.

Omar Colon-Reyes, a professor of mathematics at the University of Puerto Rico, discussed his professional research during the congress. He said he was at this meeting because he also wanted to be part of the effort to encourage Latin American mathematics.

Mathematicians attending the SEOUL ICM 2014 through the NANUM program enjoy a “Regional Networking Event” for Latin America and the Caribbean Wednesday evening in Room 403 of COEX. Last night’s event was for African mathematicians, and tonight’s is in honor of congress participants from Southeast Asia.

“I was interested to know the current situation of the mathematicial community in Latin America and how we can help,” he said.

NANUM Networking was organized as an on-site program of NANUM 2014, the program in which Korea invited 1,000 mathematicians from developing countries to SEOUL ICM 2014 under the slogan, “Dreams and Hopes for Late Starters.” *Nanum* in Korean means “generous sharing.”

Several applicants for the NANUM assistance found they could not attend, so the total number of participants in the Seoul congress through the NANUM program stood at just around 900, according to the SEOUL ICM 2014 Organizing Committee. Five NANUM networking events are scheduled during the congress, each for different continents or regions. About 400 mathematicians in Latin America applied for grants to participate and and nearly one-fourth of the applicants received the grants, according to Paolo Piccione, a professor at the Universidade de São Paulo in Brazil and member of the Mathematical Union of Latin America and the Caribbean.

During the speech, Clemens suggested that the yearning for networking among mathematicians in developing countries is a good signal for the general development of those countries. He pointed to the MENAO Symposium organized by the IMU at the COEX on Tuesday as a step toward addressing that need.

“One thing that strikes me is that when we are looking to our friends and supporters to help us find talent for mathematical centers or attract students, we often forget to make a connection with the role of mathematics and mathematical education in driving economic development,” Clemens said. “In many ways, in this technological age, there is a pretty high correlation between economic development and development in math.”

Today, Korea’s mathematics community has developed enough to host the SEOUL ICM 2014 in its capital city, Seoul. It’s the first country to be raised by two steps at once by the IMU in its five-group rankings. Although it seems that this rapid development was a natural course that began decades ago, in 1945, when Korea gained independence from Japanese colonial rule, there was no mathematics department at the only university that existed in the country at the time.

Fewer than 10 people had a bachelor’s degree in mathematics and certainly none had a degree higher than that in the discipline. Only in the 2000s did Korean mathematicians began to distinguish themselves rapidly in the international community.

The trigger of this rapid development, says Dongsu Kim, chair of the International Exchanges Committee of the SEOUL ICM 2014 Organizing Committee, was when Korean mathematicians began to receive invitations to participate in ICM meetings around the globe through the IMU program that supports young mathematicians from developing countries.

“That experience allowed Korean mathematicians an opportunity to extend their knowledge,” said Kim. “They believed they have benefited from participating in the congresses and said they had hoped more people from developing countries like them could benefit from such opportunities and help develop the mathematics community in their own countries. Since Korea is now at a level that we can even host the ICM, we believed it’s time for us to give back the benefits we have received.”

Anita Rojas, an assistant professor at Facultad de Ciencias of the Universidad de Chile, who is visiting SEOUL ICM 2014 through the NANUM program, said that when she heard about the program, she told everyone she knew about the opportunity.

“I think it’s a must for every mathematician to attend such a huge and important gathering,” said Rojas. “The experience of being surrounded by so much mathematics and so many mathematicians for more than a week – and a lot of them will be of a very high level – is going to be something I’ll always remember.”

Rojas also said she was very impressed by the development of mathematics in Korea and stressed how valuable this opportunity is for her.

“Mathematics in Korea in the 1980s was the same as the situation in Chile now,” said Rojas. “Now, Korea is hosting the ICM. I also wanted to participate in the Seoul ICM to see and to learn how Korea has achieved this. I hope this opportunity helps the Chilean mathematicians [participating at Seoul ICM] learn from the Korean mathematical community and see what they did to be in this strong position in the international community now. I hope that once we go back to Chile, we can share our impressions and create plans to develop mathematics and improve our situation.”

The Polish mathematician Stanislawa Kanas, who is a professor at the University of Rzeszów, also said she has been interested in participating in an ICM every time it was held but “couldn’t, as the cost of participating was too high.”

Kanas said she hopes this experience will allow her to “get in touch with mathematicians from abroad.”

“Such contacts will result in future joint projects, scientific achievements and publications,” said Kanas.

The organizing committee hopes the NANUM program will become widely recognized among mathematical communities across the globe so that the program can also be adopted by succeeding ICMs to make sure it is more than just one-time financial assistance for developing countries.

“We hope that this Korean word nanum will even be used as a proper noun for such support programs for future ICMs,” said Kim. “Of course it depends completely on the next country’s choice, but it’s just our small hope.”

SEOUL ICM 2014

The official newspaper of the 27th

International Congress of Mathematicians

2014 Seoul

Meaning of "Math&Presso"

A compound word joining "math" and "press" with a slight alteration and pronounced similar to "espresso," this newsletter is distributed to participants every morning and will, we hope, serve our readers like a hot cup of coffee.

Math + Press = Math&Presso ≈ Espresso

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Choi Seokjeong and traditional Asian mathematics

Confucian scholar's discovery predates the work of Euler

Korea persisted in the use of Asian traditional mathematics, born in China, until just before the First World War. Only Choi Seokjeong (1646-1715) has been known to the world as a Korean mathematician from the days of the Joseon Dynasty, which ruled Korea from 1392 to 1910. He recently was included in the "Handbook of Combinatorial Designs" (2nd edition, edited by C. J. Colbourn and J. H. Dinitz, Chapman & Hall/CRC, 2007, p. 12) as a mathematician who devised orthogonal Latin squares about 60 years before Euler.

Math in Korea

Korea is a nation with a long history. Gojoseon was the first kingdom of Korea, founded in 2333 BCE. Joseon emerged as the ruling dynasty following the collapse of Goryeo (918-1392), which was preceded by the Goguryeo, Baekje, and Silla dynasties. Joseon rule roughly spanned the eras of the Ming (1368-1644) and Qing (1616-1912) dynasties of China.

Joseon took Confucianism as a national policy rather than the Buddhism of Goryeo. The doctrine is based on several classic books including the "Analects of Confucius" and the "I Ching." Joseon considered document-recording important, and produced the "Annals of the Joseon Dynasty" and the "Journal of the Royal Secretariat," which are both included in the UNESCO's Memory of the World Register.

Choi Seokjeong (pronounced "Chay") was a Confucian scholar as well as a political official of the dynasty. He served 10 times as a chancellor, including as the prime minister. He is remembered as a politician who promoted social justice.

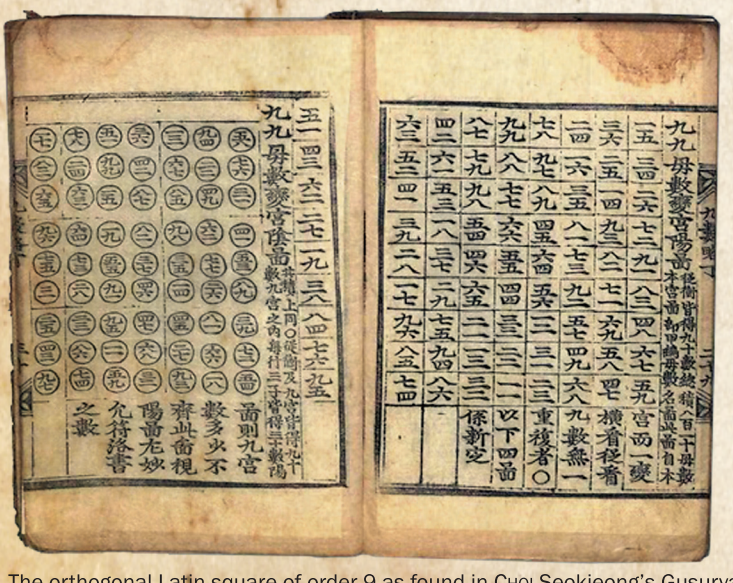
He wrote a mathematical book titled "Gusuryak" in 1715-1718. Joseon had begun to be introduced to Western culture at about that time. He had certainly read the book "Cheonhakchoham," which introduced Koreans to the Western world, but his academic knowledge was based on Confucianism. In his book "Gusuryak," he was trying to understand mathematics on the basis of the ancient Asian philosophy of I Ching. In that philosophy, all things in the universe originate from yin and yang in dynamic balance, a theory called *taegeuk*, from which four symbols, the *sasang*, emerge. This idea conveys a sense of change in the universe. The taegeuk and the sasang are both elements of the national flag of Korea.

Asian traditional mathematics was based on the text "Nine Chapters on the Mathematical Art." Choi classified mathematical operations, problems and all nine chapters into four classes, represented by the four sasang symbols. Trying to understand mathematics and patterns with those four symbols, he produced a remarkable study of magic squares and related topics, in particular an orthogonal Latin square of order 9. This is an accomplishment predating Euler's work by more than 60 years. In 2007, Choi was listed in the "Handbook of Combinatorial Designs" as the mathematician who first devised orthogonal Latin squares. He is now registered as a member of the Hall of Fame program of the Korean Academy of Science and Technology.

From a mathematical perspective, "Gusuryak" is not as good as perhaps 24 other books by other mathematicians of the Joseon period. But his idea of trying to understand mathematics according to the principle of the change of the universe given in I Ching is considered unique, and the orthogonal Latin square is a major accomplishment.

Joseon suffered a series of invasions from Japan beginning in 1592 and from the Qing Dynsasty of China in 1636-1637, and lost all its national records and books. "Gusuryak" was a big help for Joseon to recover its mathematics and related science and technology. Choi's study of magic squares contained some results never seen in Chinese mathematics, and other results are applicable today to the hexagonal tortoise problem of coding theory.

Sangwook Ree (University of Suwon)



The orthogonal Latin square of order 9 as found in Choi Seokjeong's Gusuryak (left), portrait of Choi Seokjeong (right)

Invited Speaker from Brazil: Mikhail Belolipetsky

Studies in arithmetic groups and manifolds

Mikhail Belolipetsky is a researcher at the Instituto Nacional de Matemática Pura e Aplicada in Rio de Janeiro, Brazil. His special research interest is the study of geometric and topological properties of arithmetic groups and manifolds.

Q. Congratulations on being an invited speaker at the SEOUL ICM 2014.

Thank you. I am very glad that the committee finds my research deserving to be presented at the congress.

Are there any mathematicians who have impressed (or influenced) you very strongly?

Yes, there are more than a few. Let me only talk about those with whom I had a chance to have personal interactions.

While studying at Novosibirsk State University, I participated in a home seminar by Abram Ilyich Fet. We studied topology, geometry, some philosophy, and history. His thoughts, ideas, and approach to science and society influenced me deeply. Then at the Max Planck Institute of Mathematics in Bonn, I found my meetings with Professors Gunter Harder and Serge Lang particularly important.

Later, at the Hebrew University in Jerusalem, I was lucky to work with Alex Lubotzky, whose approach to mathematics continues to surprise and excite me.

What makes mathematics interesting?

People can do it while asleep! I had my first experience of this kind when I was a youngster. I was trying to solve a tricky problem, thought about it the whole day, but could not find the solution.

Mikhail Belolipetsky

IMPA
Rio de Janeiro, Brazil

I went to sleep and when I woke up the next morning, I immediately knew the solution to the problem and had nothing more to do but write it down. It appears that I solved the problem in my sleep.

What are your long-and short-term goals?

Short-term goals appear naturally in everyday work with my colleagues and students. These are mainly problems that we are working on at the time. When successful in some way, we make the results available to other mathematicians. I do not try to set benchmarks or deadlines; this is usually not necessary for my work.

In the long term, I am looking for a better global vision which may bring new light to old open problems or open a new perspective for research. I am interested in new ideas, but it's hard to predict what kind of vision or idea will appear and from which particular area it may spread. I just try to stay alert and watch the details.

The next ICM will be held in Brazil. How does it feel?

This is a very important event for promoting mathematics and the sciences in Brazil and other South American countries. It could have a good effect on education in Brazil by displaying scientific research to a large community of people.

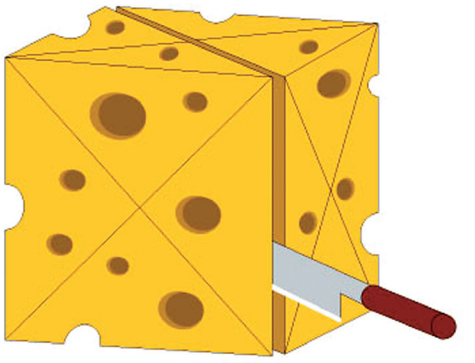
Schedules for plenary lectures have been changed. Please check the new schedules below.

Friday, August 15

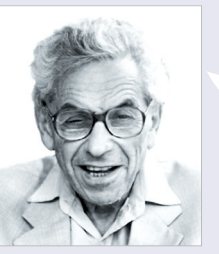
09:00 - 12:30	Plenary Lectures	**Hall D**
	09:00 - 10:00 *L-functions and automorphic representations* **James Arthur,** Univ. of Toronto, Canada	PL-4
	10:15 - 11:15 *Hyperbolic P.D.E. and Lorentzian Geometry* **Demetrios Christodoulou,** ETH-Zürich, Switzerland	PL-5
	11:30 - 12:30 *The structure of algebraic varieties* **János Kollár,** Princeton University, USA	PL-6
12:30 - 14:00	Lunch	
14:00 - 15:00	Special Lecture by Artur Avila (2014 Fields Medalist)	**Hall D**
15:00 - 18:00	Invited Section Lectures	
	1. Logic and Foundations	327ABC
	3. Number Theory	Hall E1-4
	5. Geometry	402
	6. Topology	300
	7. Lie Theory and Generalizations	301AB
	8. Analysis and its Applications	Hall E5-6
	10. Partial Differential Equations	307ABC
	11. Mathematical Physics	308ABC
	13. Combinatorics	318ABC
	15. Numerical Analysis and Scientific Computing	317ABC
15:00 - 18:00	Short Communications	
	2. Algebra	309
	3. Number Theory	310AB
	5. Geometry	316
	6. Topology	312
	8. Analysis and its Applications	320AB
	9. Dynamical Systems and Ordinary Differential Equations	324AB
	10. Partial Differential Equations	319
	11. Mathematical Physics	323
	12. Probability and Statistics	322
	13. Combinatorics	321AB
	14. Mathematical Aspects of Computer Science	326
	15. Numerical Analysis and Scientific Computing	325AB
	16. Control Theory and Optimization	311AB
	17. Mathematics in Science and Technology	313
16:00 - 18:00	zbMATH	**IC Diamond**
12:00 - 18:00	Poster Sessions	**Hall C1**
	4. Algebraic and Complex Geometry 6. Topology 7. Lie Theory and Generalizations 8. Analysis and its Applications	
18:00 - 19:00	Abel Lecture *Topology through Four Centuries* **John Milnor,** Stony Brook University, USA *Chair: Holden Helge, Norwegian University of Science and Technology*	**Hall D** SL-2
19:30 - 21:30	Abel Reception	**101**

Daily Math Puzzle

Q. How many pieces of cheese will there be if you make two diagonal cuts through three faces of a cheese cube?



Answer to Aug. 14 Daily Math Puzzle



Paul Erdős

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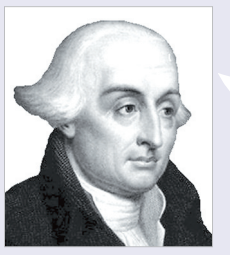

Joseph-Louis Lagrange

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