



SEOUL ICM 2014
INTERNATIONAL
CONGRESS OF
MATHEMATICIANS

Math & Presso

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President Park Geun-hye, flanked by prize winners and officials of the international and Korean mathematics societies, celebrates the opening of the 2014 International Congress of Mathematicians at the COEX yesterday. The nine-day event is being held in Korea for the first time. From left: Yanghee Choi, minister of science, ICT and future planning; Stanley Osher, Gauss Prize winner; Subhash Khot, Nevanlinna Prize winner; Martin Hairer, Fields Medalist; Manjul Bhargava, Fields Medalist; President Park; Maryam Mirzakhani, Fields Medalist; Ingrid Daubechies, president of the IMU; Artur Avila, Fields Medalist; Hyungju Park, chairman of the SEOUL ICM 2014; Phillip Griffiths, Chern Medal winner; Martin Grötschel, Secretary-General of the IMU.

Congress begins with pomp, ceremony and medals

The International Congress of Mathematicians opened in Seoul yesterday, with a twin focus on the growing role of women in the discipline and encouragement of a stronger mathematics community in developing countries.

SEOUL ICM 2014 is the first of its kind to be held in Korea. Three other Asian countries – Japan, China and India – have hosted the quadrennial event; India hosted the previous congress in 2010.

About 5,000 mathematicians from more than 120 countries are at the nine-day event at the COEX in southern Seoul, discussing the latest research and the achievements of the past four years.

The congress began with the award of the 2014 Fields Medals. One of the four recipients was the first woman to win a medal since awards began in 1936; she is Maryam Mirzakhani, 37, of Stanford University, who was cited for her contributions to the dynamics and geometry of Riemann surfaces.

“In particular, I highly honor and admire the great spirit of challenge and pas-

sion of Dr. Maryam Mirzakhani, the first female to be awarded the Fields Medal in its history,” said Geunhye Park, the first female president of Korea, during the opening ceremony of the Seoul ICM after she presented the medals to the winners.

Mirzakhani and the other three Fields Medalist – Artur Avila, 35, of the Instituto Nacional de Matemática Pura e Aplicada in Rio de Janeiro; Manjul Bhargava, 40, of Princeton University; and Martin Hairer, 38, of the University of Warwick - were introduced by Ingrid Daubechies, the first female president of the International Mathematical Union (IMU).

Three of the 2014 Fields Medals went to people with Asian or Latin American roots. Mirzakhani was born in Iran and Avila, who holds a French passport, finished his education in Brazil. Bhargava, an ethnic Indian, was born in Canada and educated in the United States.

Subhash Khot, a professor at New York University and an ethnic Indian, was awarded the Nevanlinna award at the same ceremony yesterday.

Philip Griffiths, of the Institute for Advanced Study in the United States, was selected as the winner of the 2014 Chern Medal. Created in 2010 to honor the Chinese mathematician Shiing-Shen Chern, the \$250,000 prize also allows the winner to name a charity for a matching grant funded by the Chern Medal Foundation.

Griffiths selected the African Mathematics Millennium Science Initiative as the recipient of the donation connected with his prize.

Another prestigious prize in math, the Carl Friedrich Gauss Prize, was awarded to Stanley Osher of UCLA yesterday.

In line with the congress’ slogan of “Dreams and Hopes for Late Starters,” the ICM 2014 is emphasizing efforts to put more developing countries on the international mathematics map. Korea, a leading example of such a transformation, initiated “NANUM 2014,” a project to bring 1,000 mathematicians from nearly 100 developing countries in Asia, Latin America and Africa to the congress.

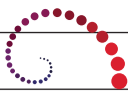
Inspired by that cause, the IMU, which

oversees the congress, also included a symposium on developing countries, the first of its kind. The one-day meeting, titled MENAO, or the Mathematics in Emerging Nations: Achievements and Opportunities, was held at the COEX on Tuesday. Kun-mo Chung, a former Korean minister of science and technology, spoke about Korea’s success story in a speech titled “Mathematics, a fundamental pillar of Korean economic development.”

“Korea achieved remarkable economic growth within a short period of time and a parallel advance was achieved in the study of mathematics, in spite of a late start,” President Park said, highlighting Korea’s fast advance in status in world of mathematics.

Jun-muk Hwang, one of 21 plenary speakers at the congress, is the first Korean in that role; he also delivered a section lecture at the 2006 congress in Madrid. Five other Koreans will speak at the Seoul ICM.

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The polynomial expansion of HONG Jeongha from the book "Guiljib" (1724).
The diagrams show the computation of an equation of degree 10.

GYEONG Seonjing, HONG Jeongha and LEE Sanghyeok

The Middle-Class Mathematicians of Later Joseon

The Joseon Dynasty (1392–1910) had a special system of social status. It maintained a small social class called Jungin, or the middle class, whose members were positioned between the nobility (Yangban) and the common people (Sangmin). They were given responsibility for many technical jobs in government administration. They formed a guild of families and they tended to marry within their own class.



One of the jobs for a Jungin was that of a professional mathematician, and the names of many were recorded in the history of the dynasty. Of course, mathematics was also studied and practiced by the nobility, but their interests were more of a theoretical and philosophical nature. Some mathematicians took care of census, tax and national accounting and others were involved in the study of calendars and astronomy.

Among the Jungin mathematicians, three are outstanding. Their stories reveal, in a way, the history of Joseon mathematics. Joseon experienced foreign invasions in 1592–98 and in 1636; the warfare devastated the country and the society, including its mathematics infrastructure. Historical records show that it was impossible after the invasions to find even a single copy of mathematics books like the Chinese "Suanxue Qimeng."

17th Century: Revival

The reconstruction of mathematics was very urgent in the mid-17th century, when Joseon decided to import the Shixian calendar (1645) of China's

Qing Dynasty and many officials struggled with the calendar. One of the Jungin officials in this period was GYEONG Seonjing (1616–?) who wrote two mathematical books while serving the government. One of the two books was lost but the other, "Muksajib Sanbeob," has been preserved. This book combines the mathematics of the only three Chinese mathematics texts available in Joseon, namely "Yanghui Suanfa" (1274–1275), "Suanxue Qimeng" (1299) and "Xiangming Suanfa" (1373).

GYEONG Seonjing's work shows the dynasty's effort to revive the mathematics and science of the first half of its 500-year reign. "Muksajib Sanbeob" explained the easier parts of the Chinese mathematics well. But it has mistakes in *gougushu* (problems using the Pythagorean theorem) and could not explain the "Zhengcheng Kaifangfa," the central part of the 13th-century Chinese theory of equations that had been understood and used comfortably in 15th-century Joseon.

18th Century: Completion

In the late 17th century, the great mathematician HONG Jeongha (1684–?) was born. While serving as a government official, he wrote a huge book called "Guiljib" (1724). All of the book, except for an appendix, was completed before 1713.

This book is special in that it completed the Chinese mathematics using clearcut explanations, and in addition it included several important characterizations and generalizations. It is especially impressive because at the time there was almost no European mathematics in Korea.

One of the most surprising characteristics of the

book is that the author, HONG Jeongha, introduces and utilizes the concept of least common multiples, a concept that had not been considered in Eastern mathematics prior to his work. The author also deals with the generalization of the *tianyuanshu* computation of polynomial expansions, a concept that had not been explained in any other sources. This method can be called the synthetic expansion and provided the theoretical background of the "Zhengcheng Kaifangfa" method of 13th-century China.

19th Century: Fusion

Thanks to the efforts of 17th- and 18th-century mathematicians, it was possible for Joseon to use mathematics proficiently.

In the 19th century, Joseon mathematics met the European discipline and changed again. One of the excellent Jungin mathematicians of the period was LEE Sanghyeok (1810–?). He served in the government and studied both the Chinese and the European mathematics imported through the dynasty's contacts with China's Qing ruler. He compared the two systems and wrote a paper emphasizing the superiority of the theory of equations in the Song-Yuan era of 13th-century China.

He wrote several books explaining traditional mathematics, including the theory of equations and series. His theory of equations explains all the Song-Yuan theory including the *Siyuanshu* of Siyuan Yujian (1303), is contained in his book "Iksan" (1868).



Young Wook Kim (Korea University)

Emmy Noether Lecture: Celebrating a female pioneer



Georgia Benkart
University of Wisconsin - Madison

I started my undergraduate studies at Ohio State University as an honors chemistry major, but after about a year and a half, I realized that I was allergic to many things in the laboratory, including the work. I had always liked mathematics and had been taking many mathematics courses, so it was natural to switch my major to mathematics. I was particularly drawn to algebra after taking abstract algebra courses and a graduate-level course in p -adic analysis with Professor Kurt Mahler, a prominent number theorist on the Ohio State faculty at that time. As a sophomore, I was one of two students awarded a Phi Beta Kappa prize — a book of my own choosing. My selection was van der Waerden's classic "Modern Algebra." The dean's office insisted on giving me both volumes, as just one of them was "too cheap" for such an award. At the time I was not aware that van der Waerden had studied under Emmy Noether and that these volumes incorporated much material from her lectures and those of Emil Artin. Kurt Mahler also had studied under Emmy Noether in Göttingen, and it was through her lectures that he learned about p -adic numbers, which became one of the major focuses of his research. So in many different ways, Emmy Noether has been an inspiration to me, and it is truly an honor to give this lecture that recognizes her profound impact on mathemat-

ics and physics.

The obstacles Emmy Noether overcame in her career are well documented. Just being admitted to study at the University of Erlangen was an accomplishment for her. The situation certainly was different when I was a university student being encouraged by my professors to pursue graduate studies in mathematics. I was fortunate to receive a National Science Foundation Graduate Fellowship to attend Yale University. When I received my doctoral degree from Yale, only about 7 percent of the Ph.D. degrees in mathematics in the United States were earned by women. Now that figure is around 30 percent. Despite that encouraging increase and other advances, there are still inequities in the number of women in tenured positions at the top universities and in the number of women invited to give plenary lectures at conferences. In 2012, the *New York Times* published an article about Emmy Noether entitled "The Mighty Mathematician You've Never Heard Of." The message of the article was that most people are unaware of Emmy Noether and of what she achieved, but they shouldn't be. The Emmy Noether Lecture at the ICM not only draws attention to one individual, her struggles, and her immense contributions, but it also serves to highlight women in mathematics to the wider community.

Korea has been a very special place for me. I have visited Korea on many occasions and have worked with Korean co-authors. Through them, I have collaborated with Korean graduate students, and I have had two Korean Ph.D. students of my own. These have been very enjoyable and rewarding experiences, and I have made many enduring friendships with Korean colleagues as a result. When I was president of the Association for Women in Mathematics in 2011, we established a joint membership agreement with the Korean Women in Mathematical Sciences. I have been impressed with the mathematical efforts in Korea and with the excellent training Korean students receive. Mathematics is held in high esteem in Korea, and its importance is recognized, which is something to be emulated. The support for ICM 2014 and for the NANUM Travel Grants Program shows an extraordinary level of commitment to the discipline and to fostering international collaboration. In 2009, I was AMS associate secretary for the joint meeting of the American and Korean Mathematical Societies held at Ewha Womans University. Over 1,000 participants attended the meeting, the vast majority of them Koreans, but 37 countries were represented. There was enormous energy and mathematical activity at that meeting. I expect the same will be true at this ICM, and I look forward to participating in it.

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In her remarks, President Park told the 3,200 people in the audience, "I would like to ask the honored mathematicians gathered here to inspire our young generation to enjoy mathematics and grow up as creative and talented individuals with a sense of creativity, and rationality who ultimately contribute to the future of humanity."

The Seoul ICM is the swan song for the incumbent leadership team of the IMU, who have served in their posts since 2011.

Martin Grötschel, the secretary-general of the IMU, introduced the new members of the union's executive committee, which does the day-to-day work of managing the group's affairs.

The next IMU president will be Shigefumi Mori, a professor of mathematics at Kyoto University in Japan and a recipient of the 1990 Fields Medal.

Mori and nine other members of the executive committee were elected at the IMU General Assembly in Gyeongju on Monday.

More than 1,000 academic papers will be presented during the Seoul ICM. In addition to those papers, many events to promote mathematics will be held. For example, James Simons, a prominent



A cultural performance at the COEX yesterday before the opening ceremony of the International Congress of Mathematicians there.

American mathematician and the world's richest because of his second career as a hedge fund manager, gave a public lecture yesterday.

Visitors will also be able to see the documentary film "How I Came to Hate Math" at the COEX on Aug. 19. In the 2013 film, famous mathematicians, including Cédric Villani, a French mathematician who won the Fields Medal in 2010, talk about the beauty of mathematics.

Villani will be present at the film's screening, which will be followed by a

question-and-answer session with the viewers.

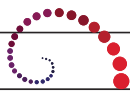
The "Imaginary" exhibition, which introduces viewers to the artistic and practical aspects of mathematics, will be held at COEX from Aug. 14 through Aug. 20.

The Bridges Seoul 2014 Conference, although not a part of the ICM agenda, will also introduce to the public a world where mathematics and art come together.

About 300 mathematicians, scientists, artists, educators, musicians, writers, computer scientists, sculptors and danc-

ers from 30 countries will be involved in presentations of papers, seminars, exhibitions and performances in Gwacheon, a southern suburb of Seoul, from Aug. 14 to 17. The conference is held annually; this is its first Asian venue.

Korean players of Baduk, or Go, and other experts on the mental sport will also try to arouse the appeal of mathematics by shedding light on the mathematical principles behind it. There will be competitions and lectures on the ancient game on Aug 19.



James Simons: Mathematician, hedge fund manager, philanthropist

Wall Street legend discusses his several careers

The legendary James Simons, is a Wall Street wizard, with the numbers (and income) to back up that appellation. He founded Renaissance Technologies in the 1980s, and from 2005 to 2007 ranked first in the world in the size of his salary, trumping even the likes of George Soros in that regard. Forbes Magazine listed him 88th in assets among the world's billionaires this year.

But his journey to Wall Street was preceded by a career as a mathematician – one that was also rich in honors if not in financial compensation.

To allow the general public in Korea a chance to hear about his career, which he began as an academic mathematician, then a fund manager, and now a philanthropist, Simons visited the SEOUL ICM 2014 to deliver a speech titled, "My life in mathematics."

Simons told a press conference before his lecture that his Simons Foundation focuses on basic sciences and said he would bring that same focus to his speech, which he delivered yesterday at 8 p.m.

"We support basic science," he said. "Science in mathematics, science in physics, science in chemistry, science in biology. Why do I support basic science? First of all, basic science does not get as much support in my opinion as it should. Federal support for research in the United States is much more tipped towards applications of science. And application is of course important. But at the root, there's a basic understanding of the world we live in. And that root does not necessarily immediately apply to how things work."

Simons said questions like "Are there gravitational waves?" or "Where do humans come from?" don't have any application, or "at least not right away."

"The first person to discover that genetic material was made of DNA – he had no idea of human genome application and all that. He was just interested in 'What is this thing and what is this made of?' That's basic science," Simons said. "And that's what I like about it."

Earlier this year, several reporters from DongA Science accompanied Hyungju Park of POSTECH, the chairman of the Seoul International Congress of Mathematicians Organizing Committee, on a visit to Simons in New York. He received the group in his no-frills office, which seemed at odds with his reported \$13 billion net worth. The only furniture in the small office was a desk, a sofa, and a bookshelf. On the bookshelf were a few mathematics texts and a framed photograph of his family.

At first glance, he appeared to be an elderly country gentleman, not a man

who managed a hedge fund with 300 employees and just under \$12 billion in assets until he retired in 2010.

Before becoming an internationally renowned fund manager, Simons was indeed a mathematician of great achievement. In 1974, he and the differential geometer Shiing-Shen Chern won attention for a unique geometrical measurement they devised and which is named after them. Two years later, Simons received the Oswald Veblen Prize of the American Mathematical Society. The prize is awarded every three years to recognize notable research achievements in the field of geometry.

Simons left academia for a job as a cryptanalyst at the National Security Agency, but moved again after a furor arose because of his outspoken opposition to the Vietnam War.

He debuted on Wall Street as a fund manager in 1976, and in 1982 founded Renaissance Technologies, a hedge fund management company. His star fund, the Medallion Fund, consistently notched annual gains of more than 30 percent; even in the dark days of 2007, when the subprime mortgage crisis hit and Wall Street groaned under heavy losses, Simons' funds performed well enough to earn him a \$2.9 billion salary for the year. It is probably fair to say that no other mathematician ever succeeded this dramatically in a different field.

Simons used the research methods of traditional mathematicians, who for obvious reasons don't usually conduct laboratory experiments as natural scientists do; mathematical research advances not through experiments but through an exchange of ideas. He also developed a salary system that avoided the trap of a zero-sum game, partly sharing profits attributable to one person's efforts with others on the team.

From Harvard Professor to Wall Street

Q. You became a professor of mathematics at Harvard University at the very young age of 23, but quit after only four years and started working for the National Security Agency. What made you to take such a bold step?

There was no specific thing that made me do so; I simply wanted to accept a challenge and try something new. At NSA, I spent half of my working time cryptanalyzing and the other half studying math. I would give my ideas on deciphering a particular cipher to the programmers, who would then scheme it into a decryption program. It was quite interesting to



James Simons, chairman of the Simons Foundation, speaking at a press conference yesterday afternoon. He delivered a public lecture last night as part of SEOUL ICM 2014.

test my ideas using computer programs. All these experiences at NSA proved to be immensely helpful in the financial world later on when making mathematical models.

I understand you were fired from NSA at the prime of your career.

At the time, the Vietnam War was at its peak, and I was quoted in the New York Times saying that the Vietnam War was foolhardy. A reporter requested an interview based on that article and asked me what I usually do during office hours. I replied, "I study math," not realizing the comment could be translated into not working and only doing personal research. That became a problem. Luckily, a professorial position opened up at SUNY Stony Brook immediately after. Of course, it shouldn't become a habit, but I often tell my students that getting fired is one good experience you can have in life, because I learned a whole lot from the incident.

But you quit yet again as a professor and changed your career to finance.

As I mentioned before, I greatly enjoy attempting things I have yet to try. But my father was very opposed when I quit as

a professor for the second time. He said I was crazy. Thinking now, I would have opposed it just as much as my father had if my son had done the same.

Keys to Success — Cooperation and Sharing

Being good at mathematics does not guarantee a fortune. What is your secret?

My secret, I think, was team work, collaboration and sharing. Our employees are mostly natural scientists and engineers such as physicists, astronomers, computer scientists and statisticians. We would gather once every week to share what each of us was working on. (Indeed, it is well known among Wall Street people that Renaissance Technologies does not favor specialists in finance, economics or business administration.) When one team developed a successful model, it was immediately applied as a trading system so everyone could take advantage of it with others.

Also, computers were never ignored. Decision-making was always based strictly on mathematical data analyses because the opinions of individuals can often disagree.

International Congress of Women Mathematicians

1st showcase of women's potential and challenges

Although the SEOUL ICM 2014 began yesterday, about 200 female mathematicians gathered on Tuesday at Ewha Womans University, a leading institution in Korea. They were joined by a few dozen students at the inaugural International Congress of Women Mathematicians (ICWM).

Although there had been two conferences during previous International Congresses of Mathematicians, yesterday's event was the first formal meeting of the group. Ingrid Daubechies, the president of International Mathematical Union, hosted the congress. As the first female president of International Mathematical Union, Daubechies was the guiding force behind the ICWM this year; it will meet together with the ICM every four years in the future.

"I am so excited to meet other women mathematicians, because there are not many chances to see them," said Rinovia Simanjuntak, who is from the Institut Teknologi Bandung in Indonesia. "I am looking forward to hearing about their work and hope that the first ICWM will encourage other women in this field."

Speaking at the congress, Hee Oh, a



Female mathematicians from around the globe gather at Ewha Womans University on Tuesday before the opening of the first International Congress of Women Mathematicians. Students from Ewha and from primary, middle and high schools in Seoul joined volunteers at the congress to celebrate the inaugural event. The congress will continue today at COEX.

professor at Yale University and a first-generation woman academic mathematicians in Korea, quoted a colleague, Kye Won Ko of Ajou University, as saying she hoped "that women and men are no longer distinguishable and we don't even need to host a separate ICWM."

A Korean graduate student in applied mathematics at Konkuk University, Hyunji Kang, said she was thrilled to be a part of the congress. "It was great to meet woman mathematicians from different countries and have the opportunity to see the world of pure mathematics."

Among the foreign participants, 100 were financially supported by the Korean Women's Mathematical Society as part of a broader program to bring 1,000 mathematicians from developing countries to the ICM. The KWMS is supporting 100 women among the 1,000.

Satellite Conferences in Korea Before ICM

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No	Code	Title	Organizer(s)	Dates	Venue (City)
1	KaAC	Imaging, Multi-scale and High Contrast PDE	Hyeonbae Kang (Inha University, Korea), Habib Ammari (Ecole Normale Supérieure, France), Yves Capdeboscq (University of Oxford, U.K.)	Aug. 7 - Aug. 9	NIMS (Daejeon)
2	KiKT	7th International Conference on Stochastic Analysis and its Applications 2014	Kyeonghun Kim (Korea University, Korea), Panki Kim (Seoul National University, Korea), Gerald Trutnau (Seoul National University, Korea)	Aug. 6 - Aug. 11	Seoul National University (Seoul)
3	DSuh	SEOUL ICM 2014 Satellite Conference on Topology of Torus Actions and Applications to Geometry and Combinatorics	Dong Youp Suh (KAIST, Korea)	Aug. 7 - Aug. 11	Daejeon Convention Center (Daejeon)
5	BKim	Classification Theory	Byunghan Kim (Yonsei University, Korea)	Aug. 6 - Aug. 9	NIMS (Daejeon)
6	SKye	Operator Algebras and Applications	Seung-Hyeok Kye (Seoul National University, Korea)	Aug. 8 - Aug. 12	Cheongpung (Jecheon)
7	KKKK	SEOUL ICM 2014 Satellite Conference on Algebraic and Complex Geometry	Local Organizing Committee: Chair: JongHae Keum (KIAS, Korea), Sijong Kwak (KAIST, Korea), Seonja Kim (Chungwoon University, Korea), Yongnam Lee (KAIST, Korea), Young-Hoon Kiem (Seoul National University, Korea), Jihun Park (POSTECH, Korea)	Aug. 6 - Aug. 10	Daejeon Convention Center (Daejeon)
8	MKim	ICM 2014 Satellite Conference on Integral Quadratic Forms and Related Topics	Myung-Hwan Kim (Seoul National University, Korea)	Aug. 7 - Aug. 11	Hotel Hyundai (Gyeongju)
9	HwLe	ILAS (International Linear Algebra Society) 2014	Suk-Geun Hwang (Kyungpook National University, Korea), Sang-Gu Lee (Sungkyunkwan University, Korea)	Aug. 6 - Aug. 9	Sungkyunkwan University (Seoul)
10	CaGP	ICM 2014 satellite Conference International Workshop on Computational Mathematics -Advances in Computational PDEs	Carsten Carstensen (Humboldt University of Berlin, Germany), Max Gunzburger (Florida State University, U.S.A.), Eun-Jae Park (Yonsei University, Korea)	Aug. 9 - Aug. 12	Yonsei University (Seoul)
11	CKKK	SEOUL ICM 2014 Satellite Conference on Geometry on Groups and Spaces	Organizing Committee: Suhyoung Choi (Ajou University, Korea), InKang Kim (KIAS, Korea), Sang-hyun Kim (Seoul National University, Korea), Kihyoung Ko (KAIST, Korea), Seonhee Lim (Seoul National University, Korea), Thomas Koberda (Yale University, U.S.A.)	Aug. 7 - Aug. 12	KAIST (Daejeon)
12	SNoh	ICWM 2014 (International Conference of Women Mathematicians)	Sunsook Noh (Ewha Womans University, Korea)	Aug. 12 - Aug. 14	Ewha Womans University (12th), COEX (14th) (Seoul)
13	Hwan	SEOUL ICM 2014 Satellite Conference: 9th Pacific Rim Conference on Complex Geometry	Jun-Muk Hwang (KIAS, Korea)	July. 27 - Aug. 1	Ritz-Plaza Hotel (Gunsan)
14	Kang	Representation theory and related topics	Seok-Jin Kang (Seoul National University, Korea)	Aug. 6 - Aug. 9	EXCO (Daegu)
15	KiLe	ICM 2014 Satellite Conference on Algebraic Coding Theory	Jon-Lark Kim (Sogang University, Korea), Yoonjin Lee (Ewha Womans University, Korea)	Aug. 11 - Aug. 12	Ewha Womans University (Seoul)
16	COFK	Homological Mirror Symmetry and Symplectic Topology	Cheol-Hyun Cho (Seoul National University, Korea), Yong-Geun Oh (University of Wisconsin, U.S.A.), K. Fukaya (Kyoto University, Japan & Simons Center, U.S.A.), Ludmil Katzarkov (University of Miami, U.S.A. & Universität Wien, Austria)	Aug. 4 - Aug. 8	IBS Center for Geometry & Physics (Pohang)
17	KKKO	ICM 2014 Satellite Conference on Extremal and Structural Graph Theory	Jeong Han Kim (Yonsei University, Korea), Seog-Jin Kim (Konkuk University, Korea), Young Soo Kwon (Yeungnam University, Korea), Sang-il Oum (KAIST, Korea)	Aug. 5 - Aug. 9	The-K Gyeongju Hotel (Gyeongju)
18	KLee	ICM 2014 Satellite Conference on Dynamical Systems and Related Topics	Keonhee Lee (Chungnam National University, Korea)	Aug. 8 - Aug. 12	Chungnam National University (Daejeon)
19	HLSV	ICM 2014 Satellite Conference in Harmonic Analysis	Sunggeum Hong (Chosun University, Korea), Sanghyuk Lee (Seoul National University, Korea), Andreas Seeger (University of Wisconsin-Madison, U.S.A.), Ana Vargas (Universidad Autonoma de Madrid, Spain)	Aug. 4 - Aug. 8	Chosun University (Gwangju)
20	Byeo	SEOUL ICM 2014 Satellite Conference on Variational Methods in Nonlinear Elliptic PDE's	Jaeyoung Byeon (KAIST, Korea)	Aug. 4 - Aug. 8	KAIST (Daejeon)

Plenary Speaker – Mori geometry meets Cartan geometry

Doing math: casual friend today, partner tomorrow

Professor Jun-Muk Hwang, of the Korea Institute for Advanced Study (KIAS) is the first Korean mathematician to be ever invited as a plenary speaker in history of International Congress of Mathematicians. Recognized as the country's top academic in the field, Hwang works on algebraic geometry and complex geometry. His lecture today is titled "Mori geometry meets Cartan geometry: Varieties of minimal rational tangents." Before Seoul ICM 2014 began, the organizing committee interviewed Professor Hwang; excerpts from the interview follow.

Q. How do you feel about being invited to give a plenary lecture?

It is a tremendous honor as a mathematician. But in terms of happiness, I would say that I was happier when I was invited to be a section speaker at the Madrid ICM in 2006. I very much enjoyed talking about my research results at the talk because the audience was fellow mathematicians who shared the same research area. On the other hand, there is pressure as a plenary speaker to explain to the audience about my research topic before beginning to talk about my results; the majority of the audience is not familiar with the subject. I particularly feel responsible to do even better as a mathematician of the host country

because the participants of the ICM are guests of my country as well as guests at my lecture. But of course, it is an incomparable opportunity to introduce my field of research. Giving consideration to those facets of the occasion, I am putting much effort into preparing my plenary lecture in a language that is familiar to the general mathematical community.

Which among your numerous research results are you most satisfied with?

As many mathematicians would say about their work, most of my results do not fully satisfy me. This is because no matter how good a result one achieves, one is always left with further, deeper questions. As for a research result that I consider having the most importance, I would choose the theory of varieties of minimal rational tangents, which was a joint research work with Professor Ngaiming Mok. But ironically, this theory is the least satisfying to me as of now because there are so many problems concerning the topic that must be further studied.

What is your secret in overcoming obstacles when researching?

Fellow mathematicians' advice is a great need when one meets a difficult problem. I was once working on a geometry problem that sprang from a promis-

ing idea I had had about three years earlier. A part of the problem that I did not expect to be very complicated could not be resolved for months. After quite some time struggling, I realized that the solution of a certain group theory problem could resolve the issue. But the problem seemed to be far from what group theorists would normally research, and certainly too complicated for me. I suddenly remembered having met briefly a group theorist at a conference several years earlier, and found it was Richard Weiss after some surfing at the conference's website. Much to my surprise, Richard showed an interest in the problem I proposed and provided me with its solution after a few months. The integration of group theory and geometry gave us a very beautiful result.

I suggest that at large conferences like the ICM, attendees should get to know many other mathematicians with expertise in areas that seem remote from theirs. The potential always exists for an unexpected collaborative research opportunity in the future.



Jun-Muk Hwang
Korea Institute for Advanced Study

What is the worst slump you experienced as a researcher and what allowed you to overcome it?

I would say it was during the years 2001 to 2005. In terms of my mathematical career, the joint research with Ngaiming Mok had occupied me almost fully but was finally coming to an end, I needed a new research topic that would allow me to move to the next level. I made several attempts at various problems to find my own direction of study.

This was soon after my daughter was born and so I had family commitments. As my daughter grew up, the pressure of caring for her naturally eased. Mathematically, I finally began concentrating on a new direction of research. Being invited to give a sectional talk at Madrid ICM further gave me confidence in my work.

Your father is a famous musician here. Do you feel the musical talent you inherited helped you in any way as a mathematician?

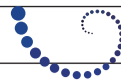
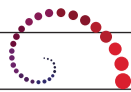
My father did not pass on any musical talent whatsoever to me. When I was very young, my siblings and I took piano lessons, but the teacher gave up on me quickly. Since then, I have never attempted to play an instrument nor do I enjoy singing, even though I naturally grew up accustomed to music.

Jump from Page 5

21	KKim	The KSCV Symposium #10: International conference on Complex Analysis and Geometry	Kang-Tae Kim (POSTECH, Korea)	Aug. 7 - Aug. 11	Kolon Hotel (Gyeongju)
22	CoCh	Pan Asia Number Theory (PANT)	John H. Coates (Cambridge University, U.K. & POSTECH, Korea), Youngju Choie (POSTECH, Korea)	Aug. 5 - Aug. 9	POSTECH (Pohang)
23	CheL	Algorithmic Number Theory Symposium - ANTS XI	Jung Hee Cheon (Seoul National University, Korea), Hyang-Sook Lee (Ewha Womans University, Korea)	Aug. 7 - Aug. 11	Hotel Hyundai (Gyeongju)
24	HoKY	The 4th International Congress of Mathematical Software (ICMS 2014)	Program Chair: Hoon Hong (North Carolina State University, U.S.A.), Local Chair: Deok-Soo Kim (Hanyang University, Korea), Conference Chair: Chee K. Yap (New York University, U.S.A.)	Aug. 5 - Aug. 9	Hanyang University (Seoul)
26	HoKR	SEOUL ICM 2014 Satellite Conference: Geometry and Physics of Gauged Linear Sigma Model and Its Related Topics	Kentaro Hori (IPMU, Japan) Bumsig Kim (KIAS, Korea), Yongbin Ruan (Univ. of Michigan, U.S.A.)	July. 28 - Aug. 1	KIAS (Seoul)
27	ByLe	SEOUL ICM 2014 Satellite Conference on Nonlinear Elliptic and Parabolic Equations and Its Applications	Sun-Sig Byun (Seoul National Univ., Korea), Hyungsuk Kong (KIAS, Korea), JongHae Keum (KIAS, Korea), Ki-ahm Lee (Seoul National Univ., Korea)	Aug. 8 - Aug. 12	KIAS (Seoul)
29	SBKO	2014 ICM Satellite Conference on Real and Complex Submanifolds	Young Jin Suh (Kyungpook National Univ., Korea.), Jurgen Berndt (King's College London, U.K.), Byung Hak Kim (Kyung Hee Univ., Korea), Yoshihiro Ohnita (Osaka City Univ., Japan)	Aug. 10 - Aug. 12	NIMS (Daejeon)
31	KiLS	Mathematical Theory of Gases and Fluids and Related Applications	Eun Heui Kim (California State Univ. Long Beach, U.S.A.), Jihoon Lee (Chung-Ang Univ., Korea), Kyungwoo Song (Kyung Hee Univ., Korea)	Aug. 10 - Aug. 12	Chung-Ang University (Seoul)
32	KaNV	Recent Progress in Random Conformal Geometry	Nam-Gyu Kang (Seoul National Univ., Korea), Pierre Nolin (ETH Zurich, Switzerland), Fredrik Viklund (Uppsala Univ., Sweden)	Aug. 11 - Aug. 12	COEX (Seoul)
35	ChCh	The 22nd International Conference on Finite or Infinite Dimensional Complex Analysis and Applications (22ICFIDCAA)	Yeol-Je Cho (Gyeongsang National Univ., Korea), Junesang Choi (Dongguk Univ., Gyeongju, Korea), Jong Kyu Kim, Kwang Ho Shon	Aug. 8 - Aug. 11	Dongguk University (Gyeongju)

Satellite Conferences in Korea After ICM

4	UnJi	International Conference on Quantum Probability and Related Topics	Un-Cig Ji (Chungbuk National University, Korea)	Aug. 22 - Aug. 26	Chungbuk National University (Cheongju)
25	ChaL	Knots and Low Dimensional Manifolds	Jae Choon Cha (POSTECH, Korea) Sang Youl Lee (Pusan National Univ., Korea)	Aug. 22 - Aug. 26	BEXCO (Busan)
28	Darm	Automorphic Forms and Arithmetic	Henry Darmon (McGill Univ., Canada), Jan Hendrik Bruinier (Univ. of Darmstadt, Germany)	Aug. 25 - Aug. 28	POSTECH (Pohang)
30	GiPP	SEOUL ICM 2014 Satellite Conference on Geometric analysis	P. Gilkey (Univ. of Oregon, U.S.A.), JeongHyeong Park (Sungkyunkwan Univ., Korea) Jinsung Park (KIAS, Korea)	Aug. 22 - Aug. 24	Sungkyunkwan University (Seoul)
33	TABS	Holomorphic Dynamics in One and Several Variables	Taeyong Ahn (POSTECH, Korea), Araceli Bonifant (Univ. of Rhode Island, U.S.A.), Scott Sutherland (Stony Brook Univ., U.S.A.)	Aug. 23 - Aug. 26	Kolon Hotel (Gyeongju)
34	HKoo	ICM Satellite Conference: Mathematical Finance and Control Theory	Hyeng Keun Koo (Ajou Univ., Korea)	Aug. 22 - Aug. 23	Pukyong National University (Busan)



SEOUL ICM 2014 officials and winners of the prizes awarded at the congress answer media questions shortly after the yesterday's opening ceremony.

Honorees call for changes in 'robotic' math teaching

Immediately after the opening ceremony of SEOUL ICM 2014 yesterday, the four recipients of the Fields Medal, along with the Nevanlinna Prize, Gauss Prize and Chern Medal winners faced the international media.

To the general public, mathematicians who are good enough to receive awards such as the Fields Medal (given only to mathematicians age 40 or younger for their "outstanding mathematical achievement") may be automatically classified as pocket protector-wearing oddities. The medalists and prize winners belied that stereotype, and had stories that were heart-warming and not at all nerdy.

Maryam Mirzakhani, who is the first female mathematician to win the Fields Medal, said she had thought about stopping her studies of mathematics when she was a teenager.

"When I was about 12, I found myself

not enjoying math," said Mirzakhani. "I thought I somehow was not that good at it compared to others. I just lost my confidence and blocked myself away from it for about a year."

She said young girls tend to lack confidence in their mathematical abilities, calling that one reason why there are so few women mathematicians today compared to the number of male counterparts.

Other prize winners emphasized the need to reform the rote way mathematics is often taught in schools. In fact, what most of the medalists and prize winners had in common was that they really became attached to mathematics either after participating in the International Mathematical Olympiads or after being guided and encouraged by parents who were also mathematicians.

"It's time for a worldwide change in how math is taught in schools," said

Manjul Bhargava, the new Fields medalist who grew up studying mathematics in Canada, the United States and in India. He said, however, that he learned much of his skills from his mathematician mother.

"Math is taught in such a robotic way," Bhargava said. "It's like 'Here's a problem and here's how you solve it.' Sometimes we don't even know why it follows certain steps. It's not interactive or artistic. We never see that in schools. Students must be able to discover the playfulness behind mathematics and problem solving. That needs to be brought into schools worldwide."

The honorees also agreed that despite public preconceptions about mathematics, the community is going through a remarkable transition.

"When I was very young, the mathematics community was very small," said Phillip Griffiths, the Chern Medal

winner. "The international research community was very small. The international congresses only attracted a few hundred people. Everybody knew everybody else. There were not many jobs either."

He continued, "I remember as a young student asking a mathematician if I should become one. The answer was, 'Only if you have no choice.' It's completely different now. I would say the role of mathematics is much bigger and the opportunities are much different. If someone asks me the same question today, I would answer, 'Yes, if you can do so.'"

Ingrid Daubechies, IMU president, commented on stories of smart youths guided into medicine or other fields. It doesn't always turn out badly, she said, recalling a radiologist who returned to school to obtain an advanced mathematics degree to further his work in analyzing radiological data.



Reception is a start for new networks

Participants in the Seoul International Congress of Mathematicians at the Korean Math Night at the conference site yesterday. About 500 people attended, including Ingrid Daubechies, the president of the International Mathematical Union, Martin Grötschel, Secretary-General of the IMU, and heads of the subcommittees of the IMU and regional mathematical unions. Shigefumi Mori, a winner of the 1990 Fields Medal who was elected as the next IMU president, was also there. The event was co-hosted by the Korean Mathematical Society, the Korea Institute for Advanced Study, and the National Institute for Mathematical Sciences.



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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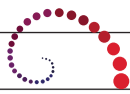
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The Organizing Committee of the International Congress of Mathematicians has commissioned the Korea JoongAng Daily, the leading English-language newspaper in Korea, to publish an official daily newspaper for the congress. The editors and the organizers are not responsible for the opinions expressed by the interviewees and published here or for any consequences arising from the accuracy of the information herein.

The nation's leading English newspaper
KOREA JOONGANG DAILY

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Tour Programs

ICM participants are cordially invited to join optional tours in and around Seoul.
Reservations for tour programs can be made at the 3rd floor, Hall D Lobby (Tour Desk).
Also check there for reservation deadlines.

No.	Tour Name	Date
DMZ 1	DMZ and War Museum Tour (08:00-17:00)	August 13, 14, 16, 17, 19
DMZ 2	DMZ Afternoon Tour (12:00-18:30)	August 12, 17, 21
HT 1	Morning Palace Tour (09:00-13:30)	August 15, 17
HT 2	World Cultural Heritage Tour (12:00-18:00)	August 13, 20
FT 1	Traditional Attractions Tour (HT1+HT2) (09:00-18:00)	August 15, 17
FT 3	Back to Ancient Korea (09:00-17:00)	August 17
ET 3	Temple Life of Korea (09:00-16:00)	August 17
NT1	Dinner Buffet Cruise Tour (18:00-22:00)	August 17
FMT 1	Everland Tour (09:00-18:00)	August 18

• Abbreviation Guide: DMZ Tour (DMZ), Half Day Tour (HT), Full day Tour (FT), Experience Tour (ET), Night Tour (NT), Family Tour (FMT).
* All tour programs are subject to cancellation if the minimum number of 20 persons is not met.



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



Thursday, August 14

07:00 - 09:00	U.S. Breakfast	101
07:30 - 09:15	IMU EC Breakfast	IC Apollo
09:00 - 12:30	Plenary Lectures	Hall D
	09:00 - 10:00 <i>Virtual properties of 3-manifolds</i> Ian Agol , University of California, Berkeley, USA	PL-1
	10:15 - 11:15 <i>Mori geometry meets Cartan geometry: Varieties of minimal rational tangents</i> Jun-Muk Hwang , Korea Institute for Advanced Studies	PL-2
	11:30 - 12:30 <i>Mathematics of sparsity (and a few other things)</i> Emmanuel J. Candès , Stanford University, USA	PL-3
12:30 - 14:00	Lunch	
14:00 - 15:00	Special Lecture by Martin Hairer [Fields Medalist]	Hall D
15:00 - 18:00	Invited Section Lectures	
	2. Algebra	Hall E5-6
	3. Number Theory	Hall E1-4
	4. Algebraic and Complex Geometry	301AB
	6. Topology	307ABC
	8. Analysis and its Applications	402
	9. Dynamical Systems and Ordinary Differential Equations	317ABC
	10. Partial Differential Equations	318ABC
	12. Probability and Statistics	300
	14. Mathematical Aspects of Computer Science	327ABC
	17. Mathematics in Science and Technology	308ABC
15:00 - 18:00	Short Communications	
	1. Logic and Foundations	310AB
	2. Algebra	309
	5. Geometry	316
	6. Topology	312
	8. Analysis and its Applications	320AB
	9. Dynamical Systems and Ordinary Differential Equations	322, 324AB
	10. Partial Differential Equations	319
	11. Mathematical Physics	323
	13. Combinatorics	321AB
	15. Numerical Analysis and Scientific Computing	325AB
	16. Control Theory and Optimization	311AB
12:00 - 18:00	Poster Sessions	Hall C1
	1. Logic and Foundations	
	2. Algebra	
	3. Number Theory	
	5. Geometry	
17:00 - 21:00	IMSI Director's Meeting	IC Jupiter
18:00 - 19:00	Emmy Noether Lecture <i>Connecting the McKay correspondence and Schur-Weyl duality</i> Georgia Benkart , University of Wisconsin-Madison, USA Chair: <i>Christiane Rousseau</i> , Université de Montréal, Canada	Hall D SL-1
18:00 - 22:00	Canada Reception	IC Allegro
19:00 - 21:00	ICWM Reception	102-104

Announcement of Change

NANUM Reimbursement Room has been relocated to 2F Room 208 (ICM) and 3F 305 (KIAS) (unchanged).

Daily Math Puzzle

Q.

Each alphabet in the equation below represents a different number. Same alphabets represent the same number. What number does each alphabet represent?



Paul Erdős

COFFEE
+ COFFEE
+ COFFEE

THEOREM

Q.

Each alphabet in the equation below represents a different number. Same alphabets represent the same number. What number does each alphabet represent?



Joseph-Louis Lagrange

SQUARE
+ SQUARE
+ SQUARE
+ SQUARE

NUMBER



Answer to
Aug. 13 Daily Math Puzzle

5 Wins, 2 Losses