

EMS ERCE LABEL

Emerging Regional Centres of Excellence

Vietnam Institute for Advanced Study in Mathematic

Emerging Regional Centres of Excellence (ERCE): Institute that plays and will play a central role in the training of international students from less developed countries in their region.

Introduction

Name of Institution:

Vietnam Institute for Advanced Study in Mathematics

Address: The 7th floor, Ta Quang Buu Library, University of Science and Technology, 1 Dai Co Viet Street, Ha Noi, Viet Nam.
Tel: +84 4 3623 1542 - Fax: +84 4 3623 1543

Managing Director: Professor **Nguyen Huu Du**

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Vietnam Institute for Advanced Study in Mathematics (VIASM) was founded in December 2010 and was officially in operations in January 2012.

VIASM main missions are: (i) to become an excellent academic center for mathematicians in other institutes and colleges to carry out valuable ideas and good quality research, as well as assisting talent training; (ii) to improve mathematical research capability in colleges and institutes in Vietnam; and (iii) to be the main institution in implementing the National Program for the Development of Mathematics from 2010 to 2020 (NPDM).

VIASM model is adapted from other advanced institute in the world such as Max-Planck, IAS Princeton, KAIST, JAIST, etc.

Fields of study

VIASM organizes research groups with the fields defined by the Scientific Council and the International Advisory Board. The real topics selected among the ones proposed by research groups or individuals. Some major fields: Application of Mathematics in Information Technology; Algebra, Algebraic Geometry and Number Theory, Algebraic Topology; System and Control

Theory; Complex Analysis and Complex Geometry; Combinatorics; Probability Theory; Ordinary and Partial Differential Equations etc.

Research groups, research fellows and students

Most of research fellows come to work at VIASM in research groups. During their visits, they might organize academic activities (workshops/conferences, lectures, seminars etc.) which were planned in their research proposals. Research fellows can also invite international scientists (mostly professors) to come to collaborate on their scientific activities. In the last three years, VIASM has hosted prominent professors of mathematics, Information Technology and Mechanics who are either from Vietnam or abroad, to come to do research or to engage in other scientific activities at the Institute. Therefore, not only traditional research areas in Vietnam have been strengthened but also some other new research directions (such as Mathematical Finance, Geometry-Algebra-Number, etc.) have arisen.

There have been 48 research groups and 39 individuals with the total of 344 research fellows and visiting professors in the last three years. In particular, among them there were two groups working on applications of mathematics in information technology; there were 104 international mathematicians from 18 countries and 40 Vietnamese professors working overseas. Many of them are well-known mathematicians such as professors B. Gross, J. Lafferty, R. T. Rockafellar, T. C. Hales, J. Harris, C. A. Micchelli, I. Morrison, B. Mordukhovich (USA); L. Illusie, J. P. Demailly, N.E. Karoui, J. B. Lasserre, P. L. Combettes (France); H. Esnault (Germany), V. Berkovich (Israel), J. Coates (UK), E. Welzl (Switzerland), or Vietnamese professors such as professors Dinh Tien Cuong (Singapore), Nguyen Quoc Son (France), Vu Ha Van, Duong Hong Phong, Pham Huu Tiep (USA), etc...

Notably, professor Ngo Bao Chau (Fields Medalist 2010, VIASM Scientific Director) often invites prominent professors to come to VIASM every year (during the 2-3 month summer period) to form research group in Number Theory as well as organizing remarkable scientific activities at the Institute.

There has been an increase in the number of well-known mathematicians who come to VIASM as well as their visit frequency. VIASM strongly believes that they play very important role in improving the quality of VIASM activities as well as the quality of mathematical research in Vietnam at large.

Other scientific activities

Weekly seminars held by research groups are regular scientific activities of VIASM.

Conferences, workshops have been held with topics associated with research groups' projects. This can publicize research projects as well as encouraging young mathematicians, PhD students and under-graduate students to do research.

VIASM has also organizes schools (summer, autumn, spring schools) and training courses for students, mini-courses for math teachers and public lectures as well.

In nearly four years, the Institute has sponsored 137 students from outside Hanoi to attend special schools and mini-courses (with the duration of 3 weeks to 2 months), ***among them there were 15 international students***. The Institute has also sponsored the total of about 400 students in the duration of three weeks each year to study at summer schools for students which are jointly held by the Institute of Mathematics - VAST and VIASM.

About 6400 individuals have participated in conferences, workshops, schools and training courses organized by VIASM from February 2012 to June 2015. They are PhD students, lecturers, teachers, college and highschool students who have pursued for better knowledge, looking for fresh ideas for their research. Most of the lecturers (for schools/courses) and speakers (for conferences) are leading mathematicians in the particular fields.

Furthermore, there have been special programs in terms of duration and scope of activities at VIASM such as Algebraic Topology activities 2013 (together with weekly seminars, five special mini-courses have been held, with 10 – 12 participants), Special Semester on Commutative Algebra 2013 (five special mini-courses with the participation of more than 20 people during 6 months and an International Conference on Commutative Algebra and its Interaction to Algebraic Geometry and Combinatorics in December 2013), or the Summer Program "PDEs and Applied Mathematics" included two short courses and one workshop targeted to undergraduate students, graduate students and post-docs (in July and August, 2014).

1. The standing requisites to gain the ERCE label

The Institute continually organizes its scientific activities before and after gaining the ERCE label, which open not only to Vietnamese students but also to international students (registration free). All the activities are public at:

<http://viasm.edu.vn/news-and-events/sci-activities/conferences/?lang=en>.

Many of them also posted on some international websites/ forums.

Conferences and Workshops

VIASM has organized 32 conferences and workshops from 2012 to June 2015 (2012: 5, 2013: 7, 2014: 14, January-June/2015: 6). Some notable ones:

- A regular conference of VIASM is the *VIASM Annual Meeting* which follows the example of Bourbaki seminars. VIASM invites five first-rate mathematicians every year to report on exciting developments in their field of expertise, and generally not on their own work. The reports are to be written by the time of the meeting and will be published in a special issue of *Acta Mathematica Vietnamica*. Leading professors have been given talk at the series of meeting such as J. P. Demailly (France, 2012), H. Esnault (Germany, 2012), B. Gross (USA, 2012), J. Coates (UK, 2013), Duong Hong Phong (USA, 2013), L. Chen (Singapore, 2014), E. Szemerédi (USA, 2014, Abel Prize 2012), Vu Ha Van (USA, 2014, Fulkerson Prize 2012), C. Villani (USA, 2015, Fields Medalist 2010), Hwang Jun-Muk (Korea, 2015), Henri Berestycki (France, 2015), etc.

- *The VMS-SMF Joint Congress* jointly organized with the Vietnam Mathematical Society (VMS) and the French Mathematical Society (SMF) in August 2012 in Hue. The Congress attracted 440 participants, among them there were 92 international mathematicians and 57 Vietnamese participants from abroad. In particular, Prof. J. C. Yoccoz (Fields Medalist 1994) and Prof. Ngo Bao Chau (Fields Medalist 2010) gave plenary talks at the Congress.

- *The 5th International Conference on High Performance Scientific Computing*. This conference (5-9 March 2012) was the first event held at VIASM, just after its International Inauguration, and attracted more than 250 participants (170 internationals from 27 countries/territories and 12 Vietnamese scientists from abroad). *The 6th International Conference on High Performance Scientific Computing* was also held this year (16 – 20 March, 2015) which attracted 300 participants (150 are international or Vietnamese scientists from 29 countries/territories).

- *Pan Asian Number Theory (PANT) Conference 2013* (22 – 26 July, 2013): attracted more than 50 internationals (most of them are young number theorists from Asian countries) and eight Vietnamese number theorists. The series is held yearly in one of Asian countries.

- *International Conference on Commutative Algebra and its Interaction to Algebraic Geometry and Combinatorics* (16 – 20 December 2013 at VIASM and Institute of Mathematics - VAST) was one of the biggest conferences on commutative algebra so far, with 107 participants, including 57 foreign

professors and two Vietnamese professors from abroad. A well-known professor of commutative algebra - D. Eisenbud (Berkeley, USA) gave a plenary talk at the conference.

- A conference on Moduli spaces was organized in the form of *Spring School "Birational geometry and stability of moduli stacks and spaces of curves"* by a group of foreign professors and a group of mathematicians from Institute of Mathematics – VAST and 20 international mathematicians joined from USA, Spain, France, Germany, and South Korea.

Special schools and mini-courses

In the last three years, VIASM has organized 14 special schools and 31 mini-courses. Some notable ones are:

- *Mini-course "An introduction to randomness in two dimensions"* in January, 2013 by Prof. W. Werner (Paris 11, France, Fields Medalist 2006).

- In July 2013 VIASM jointly organized the *SEAMS School "Algebraic curves"* with the South East Asian Mathematical Society (SEAMS), which involved 30 undergraduate students and graduate students (**5 of them are international students from South East Asia**).

- *Mini-course "Group cohomology and T-functor"* by Prof. J. Lannes (France) who is one of the leading mathematicians in algebraic topology (April-May, 2014).

2. International students training potential under the ERCE label

There have been many more international students (both in Vietnam and in the world) get to know about VIASM and its activities and register at the Institute. Some of them join research groups at VIASM and other attend the Institute's scientific events.

The Institute reputation has also gained from institutional levels. VIASM has set up training and research cooperation with certain institutions in the region and in the world such as the Abdus Salam School of Mathematical Sciences (ASSMS, Pakistan), the Mathematics Research Center (CIMAT, Mexico); NUS and NTU (Singapore), KIAS and NIMS (Korea), LIAFV (CNRS, France). There are huge potential on training international students from these centres, as well as on sending Vietnamese students to them.

VIASM is collaborating with some other institutes to set up an excellent PhD program in mathematics. With this program, the Institute aims at enhancing its training and research capability.

With the ERCE label, VIASM believes that there will be more initiatives taken to attract international students.

3. Hosting of international students

The Institute hosted 15 international students from Thailand, Indonesia, Malaysia, India (in the Spring school “Analysis and approximation in optimization under uncertainty” <http://viasm.edu.vn/activities/spring-school/participants/?lang=en>, and the SEAMS School “Algebraic curves” http://viasm.edu.vn/activities/school_ac2013/list-of-participants/?lang=en).

Some of them spread the information on VIASM to their schoolmates or faculties. The Institute has welcomed guests from some other universities in Thailand who heard about us and come for possibilities of cooperation.

We also have hosted some young international researchers who joined research groups, as well as outstanding researchers who give talks at its conferences.

The Institute continues to offer places for exchange international students from its partnering institutions to join research groups at VIASM or to attend its conferences/workshops/mini-courses etc.

4. Achievements

VIASM has built up an academic and advanced working environment, appreciated by the national and international mathematical community;

VIASM has attracted a large number of Vietnamese mathematicians from abroad as well as famous international mathematicians come to VIASM to participate in research, training or organize conferences, mini-courses, including many reputable professors: J. P. Demailly, Nicole El Karoui (France), H. Esnault (Germany), J. Coates (United Kingdom), L. Chen (Singapore), B. Gross, R. T. Rockafellar and J. Lafferty (USA); Hwang Jun-Muk (Korea), Pham Huu Tiep (USA), W. Werner (Fields Medalist, 2006), J. C. Yoccoz (Fields Medalist, 1994), C. Villani (Field Medalist, 2010), E. Szemerédi (Abel Prize, 2012), Vu Ha Van (Fulkerson Prize, 2012), etc.

From January 2012 to June 2015, there were 91 international mathematicians coming from 14 countries and 32 Vietnam mathematicians from abroad working at VIASM, excluding participants in conferences, workshops;

The variety of scientific activities has met the demand and attracted many participants (lecturers of universities, PhD students, graduate students, students and researchers), had a positive effect on education and research in college in some following aspects:

+ Through the VIASM's scientific activities, more than 6.400 people had gained new knowledge, had learned new results of the research fields, had have an opportunity to exchange with the leading national and international mathematicians; since then improving the quality of teaching of university lecturers on education and research, especially of young ones;

+ Creating an academic atmosphere and promoting research activities among young mathematicians. There have been more and more research fellows in VIASM who are PhD students, graduate students or new graduates whose publications appear in international journals. This trend will affect to the research universities development strategy.

+ Strongly promoting the collaboration between the working groups, mathematicians of different age groups, in or outside Vietnam. VIASM has created an academic environment for Vietnamese mathematicians to participate in research, work in new research group, since their scientific performance has been improved after working at the Institute.

The number of publications and preprints of research fellows worked at VIASM has increased year by year. In 2012, there were 6 publications and 26 preprints. In 2013, the number continued to rise 19 publications and 49 preprints. In 2014, it had increased to 37 publications and 50 preprints; in the half year of 2015, there were 17 publications and 31 preprints. Most of preprints were completed and published in the ISI journals (SCI, SCIE).

5. Conclusion and suggestion

Gaining the ERCE label really helps VIASM a lot to achieve its goals so far in terms of enhancing its reputation and partnership and attracting international students. Since the benefits to VIASM and the community is clear, we recommend to continue the program.

The program would help us to inform the information on its labeled centers, as well as the centers' activities so that many more international institutions and students can approach us.

Since VIASM do not have much budget for sponsoring the international students to attend its activities (most of its budget source is from the government, which supposed to use for Vietnamese mathematical community), the program can help in the fund-raising, sponsorship or connect the Institute with the potential partners/ sponsors.

Therefore, we suggest more effective communication between us and the program, as well as among the centres labeled ERCE.