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*Michel Waldschmidt*  
*Professeur émérite*

Paris, October 5, 2015

**Report on the SEAMS School**  
**Number Theory and Applications**  
**in Cryptography and Coding Theory**  
**August 31 - September 9, 2015, Ho Chi Minh City**  
**(Vietnam)**  
**Department of Computer Science at**  
**Vietnam National University HCMC – VNU.HCM**

I visited Vietnam in 2006, 2007, 2008, 2009, 2010. The reports on these visits are on my website

<http://webusers.imj-prg.fr/~michel.waldschmidt/cooperations.html>

It is at the occasion of my first visit to Vietnam in 2006 that I met **Pham Minh Hoang** who was teaching in the Applied Mechanics Lab of the **Ho Chi Minh City University of Technology** (HCMUT), alias Institut Polytechnique (IPHCM).

In 2007 and 2009, I taught courses in the Department of Mathematics & Computer Sciences of **Ho Chi Minh University of Science HCMUS**, invited by Bui Xuan Hai, head of the Algebra section. One of the students who attended my courses, Nguyen Ngoc Ai Van, went to Ottawa and obtained her PhD in 2013 under the supervision of Damien Roy.

Besides, I came back to Vietnam (Hanoi and Ho Chi Minh City) in 2007 for Edumath and Campus France.

More recently, I participated to the **Joint congress of the French Mathematical Society (SMF) and the Vietnamese Mathematical Society (VMS)** in Hué in 2012.

From August 31 to September 9, 2015, a SEAMS Research School on *Number Theory and Applications in Cryptography and Coding Theory* took place in Ho Chi Minh City (Vietnam). One of the main goals was to introduce the students to the subjects which will be developed during the **CIMPA-ICTP-VIETNAM - Research School on Lattices and application to cryptography and coding theory** in Ho Chi Minh City, August 1-12, 2016.

The topics which were covered during this SEAMS School were:

- Introduction to Coding Theory, by Michel Waldschmidt.
- Elliptic Curve Cryptography, by Francesco Pappalardi.
- RSA and its variants, by Thuc D. Nguyen, Long D. Tran and Thu D. Tran.
- Lattices and applications, by Dung H. Duong, Khuong A. Nguyen, Ha Tran.

My first course, on Tuesday, September 1, 2015, was an elementary introduction to error correcting codes. The slides can be downloaded from my web site:

<http://webusers.imj-prg.fr/~michel.waldschmidt/ppt/Coding2015.ppt>

Including the 6 Vietnamese lecturers (1 from Hue and 5 from Ho Chi Minh City) and the two European speakers, the total number of participants was 74: namely 32 Vietnamese participants: (2 from Da Lat, 2 from Dong Nai, 11 from Ha Noi and 17 from Sai Gon) while the other 34 international participants came from Nepal (11), Thailand (7), Indonesia (6), Philippine (5), Cambodia (3), Malaysia (2).

The 11 Nepalese participants (including 3 women) were supported by a special program of IMU (see below). The 3 Cambodian participants were supported by the **International Science Programme (ISP)**, Uppsala Universitet.

The opening ceremony took place on the morning of the second day. Talks were given by the General Consul of France in HCMC, Emmanuel Ly-Batallan, and by the Consul General of Italy in HCMC, Carlotta Colli. There is a strong support coming from Italy for the cooperation in mathematics with Vietnam. Five among nine lecturers of the 2016 CIMPA School will come from Italy.

The next day, with **Pham Minh Hoang**, we were invited by the General Consul to his residence. We discussed many topics including the cooperation programs in mathematics. Among them are the LIAFV (**Laboratoire International Associé Formath Vietnam**) and the PUF (**Pôle Universitaire Français Orléans–Ho Chi Minh Ville**) in mathematics and their applications.

This SEAMS School had several positive side effects. The first one is related

with the IMU support for Nepalese mathematicians.

<http://www.mathunion.org/cdc/grants/project-support/project-support-2015/nepal/>

*CDC has supported 11 mathematical leaders from Nepal to participate from August 31 to September 8, 2015, in Ho Chi Minh City (Vietnam) in the SEAMS School "Number Theory and Applications in Cryptography and Coding Theory" which was organized at the Department of Computer Science at HCMC Ho Chi Minh City University of Science – VNU.HCM.*

*This SEAMS school allowed them to regroup and make plans for moving forward, as well as sharing the needs of the Nepalese math community with their colleagues from other countries within the region. This contributed to connect mathematicians from Nepal with mathematicians from Vietnam and neighboring countries and to help them to make plans for support and regional projects after the earthquake that had hit Nepal recently.*

*Portraits of all participants can be found here:*

<http://www.mat.uniroma3.it/users/pappa/missions/albums/SEAMS2015/>

A separate report on the participation of the Nepalese delegation will be produced.

Also, this SEAMS School provided the opportunity to develop the links between the [University of Cantho](#) in Vietnam on the one side, the [Royal University of Phnom Penh](#) (RUPP) in Cambodia on the other side. In May 2015, Nguyen Trung Kien from Cantho University visited Phnom Penh and established the first links. He invited the three Cambodian participants to the SEAMS School, as well as Francesco Pappalardi, myself and Mai Hoang Bien from VNU.HCM, to visit his university during the week-end of the SEAMS School. He organized a workshop on September 5. I gave a lecture *on the Brahmagupta-Fermat-Pell Equation*, while Francesco Pappalardi gave *an introduction to the Riemann hypothesis for beginners*. Nguyen Trung Kien also organized a dinner on Saturday evening and a visit to the Mekong Delta on Sunday morning. We are thankful to him for his invitation and his warm welcome. We also appreciated during this week-end the kind help of Mai Hoang Bien, a colleague from Bui Xuan Hai in VNU.HCM.

A further positive side effect of the SEAMS School has been the opportunity for Vietnamese mathematicians from Hanoi and Ho Chi Minh City to have useful exchanges involving future program of cooperation.

The cost of international flights could be reduced thanks to the efficient contribution from Dung H. Duong, who found cheaper flights for most of the international participants than what they were asking for in their initial application. In spite of that, due to the relatively large number of participants, the budget was tight. Besides, one of the two participants who was robbed by a motorbike lost her passport and needed to postpone her flight back by one day; the extra cost was taken care of on the budget of the school. Fortunately, both CIMPA and VNU-HCM agreed to increase their contributions after the end of the school.

CIMPA has a rule according to which half of its support is given in advance, while the other half is given only after the end of the event. However all the money needs to be spend before the end of the school, so the only way is that someone brings cash and asks later to be reimbursed by CIMPA – which is what I did.

The main organizers of this SEAMS School, Ha Tran and Dung H. Duong, did a superb job; they have been devoted and succeeded very well to make this event a success. They also created a friendly atmosphere, and all participants will keep a fond memory of this meeting.

A handwritten signature in black ink, reading "mw.est" with a horizontal line underneath.

*Michel Waldschmidt.*

This report is available on the internet at URL

<http://webusers.imj-prg.fr/~michel.waldschmidt/articles/pdf/RptSEAMSSchoolHCMC2015.pdf>



The organizers offered to each participants a nice green T shirt which everybody has been wearing during the last day.

