



Institut de Mathématiques de Jussieu

U.M.R. 7586 du C. N. R. S.

Université Pierre et Marie Curie (Paris 6)

Faculté de Mathématiques Pierre et Marie Curie (UFR 929)



CENTRE NATIONAL
DE LA RECHERCHE
SCIENTIFIQUE

Michel Waldschmidt

Paris, April 12, 2012

Institut de Mathématiques

«Théorie des Nombres», Case 247

4, Place Jussieu

F-75252 PARIS

Report on my visit to Cambodia from March 29 to April 10, 2012

The main purpose of this visit was to teach a course on number theory for the students of **Master 2 (RUPP-CIMPA Master Training Program)** of the **Royal University of Phnom Penh RUPP** (=URPP - Université Royale de Phnom Penh).

I shared this course with Fidel Nemenzo. My stay in Phnom Penh gave me also the opportunity to discuss with him of several other topics, including **The Southeast Asian Mathematical Society** (SEAMS, of which he was the president until last year), and also the CIMPA Research School on **Algebraic Curves over finite fields and applications** that we jointly organize in Manilla, Philippines, from July 22 to August 2, 2013.

• Schedule

I left Paris on March 28 and reached Phnom Penh on March 29. I stayed until April 10 when I came back to Paris.

Just before arriving in Cambodia I was told that the university will be closed after April 6 for vacations - this information was not given to me when I proposed the dates of my stay. On March 30, I was told that the university will be closed from April 2 to 4, because of the 20th Summit of the Association of Southeast Asian Nations (ASEAN) in Phnom Penh. Apparently the decision was taken at a very late stage and nobody was aware of it before. I asked Chan Roath whether I could have the three corresponding courses (April 2, 3 and 4) in Khemarak University and he kindly agreed.

I requested an appointment with the Rector, Lav Chhiv Eav, and with the Dean of the Faculty of Science of RUPP, Kamerane Meak, but none of them was available during my stay.

On April 3, Tuesday, I met Chan Roath and Fidel Nemenzo. On April 4, Wednesday, after my course, I had a meeting with several colleagues from Phnom Penh, including Lin Mongkolsery, Sim Tepmony, Seam Ngonn, Ham Karim, Sophaep Khvay and Tann Chantara. My description of the situation below mainly is a result of these discussions. After our meeting on April 4, these colleagues kindly invited me for dinner.

On April 6, Friday, I was invited for lunch by Antoine Perrier-Cornet (**Institut de Technologie du Cambodge**, ITC) with Randall Douc and Gilbert Palaoro, **Agence Universitaire de la Francophonie** (AUF).

• The course

I gave 5 courses, on April 2, 3, 4, 5 and 6, of 4 hours each. For the first one I started with a **beamer lecture** entitled **On the Brahmagupta-Fermat-Pell Equation $x^2 - dy^2 = \pm 1$** .

The rest of my course was mainly devoted to reading the book by André Weil: *Number*

Theory for Beginners, Springer Verlag, 1979. During the last course I scheduled the **final exam**. More information is on my web site

<http://www.math.jussieu.fr/~miw/enseignement.html>.

At the beginning of the academic year 2011–2012, 13 students were selected for this Master 2 program; one gave up, so there were 12 students attending my classes. This includes two students from Laos. All these 12 students attended all my courses, made the **homework** and succeeded the exam. I already knew most of them, since they attended my **preliminary courses for the Master 1** program on linear algebra and on real analysis which I gave the previous academic year from September 27 to October 20, 2010.

At the end of his course, on March 30, 2012, Fidel Nemenzo gave them some **homework**, they completed it on April 5 and I gave them the correction on May 6 at the beginning of my last course and before the final exam. For this **homework**, they all succeeded very well, but there was a strong correlation among the content of the 12 copies.

For the final exam, I made sure that the students were sufficiently far one from another so that they could not communicate. During my course, I had given a detailed solution for each of the first 5 exercises of the exam, which were taken from the book of Weil given in the reference. The last exercise was solving a Pell equation; I had given them a receipt with many examples at the beginning of my course. So I was expecting that the reasonable students should be able to complete all solutions (and this is why I gave them only 2 hours). This was indeed the case for 3 students, who got the full mark. Another one gave very good solutions for 4 of the 6 exercises. The next 5 students solved reasonably well half of the exercises. So 9 students pass. The three other students solved only one question (at most).

The students who have good marks are not at the level of an international Master 2 diploma; if they want to pursue their studies they need first to complete a Master 2 in some foreign institute.

Three students of the current Master Program, Hout Sokloeun, Veng Sotheara and Kum Romdoh, have been selected to participate in the **Summer Program in Mathematics (SPIM)** 2012 which will take place in HRI (Harish Chandra Research Institute, Allahabad, India) from June 16 to July 4, 2012. The support for their expenses will be confirmed by the Committee for Developing Countries of the European Mathematical Society during its meeting in Limoges in April 14, 2012. For each of them, it will be the first time that they go abroad.

One main challenge for the colleagues in charge of this master program is to obtain sufficiently many scholarships for the bright students to pursue their studies abroad. For the French speaking students, there are possibilities through the AUF - but the number of francophone students is very small. Some solutions have been found in different Asian countries (Vietnam, Thailand, India, Pakistan, China, Hong Kong, Korea). A student from Cambodia has been selected by the international program of the Paris Graduate School of Mathematical Sciences **PGSM**. Still, more possibilities are needed.

- **The situation of Master level teaching in Cambodia**

The university receives funds from the government for BSc; there is no support at all

for MSc, and there is no way to get any support from the university for a Master Program: there is no line of budget devoted to such a program. The teachers from the university are supposed to teach at the BSc level. If they teach at the MSc level they are not paid by the university for that duty: they do it either on a volunteer basis or else if there is another source of support. The government does not support MSc neither through the university nor otherwise. When the university asks for a MSc program, the government gives its approval, but no financial support. All the Master Programs in other subjects in RUPP are fully funded by NGOs (or by registration fees – in some subjects they are quite high, not in mathematics).

The Master program in mathematics in RUPP is referred to as *the CIMPA program*. It is considered that the NGO which supports this program is CIMPA. In particular the university will not request other sponsors for this Master Program. Another support will be asked only if the CIMPA decides to stop supporting this program, in which case this program has to be stopped, and another program may be considered. The [International Science Programme \(ISP\)](#) at [Uppsala University](#) of the [Swedish International Development Cooperation Agency \(SIDA\)](#) supports the Master Programs in Physics and Chemistry, but URPP does not request its support for the Master in Mathematics as such, since it is considered as being the *CIMPA program*. The support from ISP in mathematics has been requested for other goals: it includes visits of scientists from Sweden to Cambodia, scholarships for Cambodian students to study abroad. Also, ISP may contribute to improve the web site of the university. The members of RUPP do not use it for their e-mail address, because it is not reliable. A workshop [“Finding Online Information in Mathematics”](#) was held in Phnom Penh from 8-12 August 2011 by Anders Wandahl. I asked whether it was useful. The colleagues told me that they still have no access to data bases like Math Reviews or Zentralblatt - these accesses should be obtained through the official server of the university, but this server is not working properly.

When I reached the university for the first course I gave in RUPP on Thursday, April 5, the rooms were locked and the students were trying to find some available room which could be opened – they succeeded after a quarter of an hour. There is so far no specific room devoted to this Master program. Michel Jambu wrote on December 20, 2011, to the Rector of URPP asking that a room be devoted to this master in mathematics, which would be accessible all working days, for the students and the teachers. This room should be equipped with a board and a beamer which would allow the teachers to use their own laptop. This seems to be a minimal requirement. No answer has been given so far.

[The Fifth International Conference on Science and Mathematics Education in Developing Countries](#) was organized by Chan Roath in Zaman University, Phnom Penh from March 1 to 3, 2012. When I asked him how it had been going, he said it was a big success. Since he knows me, he anticipated what I was going to say, he immediately added “depending on the point of view”. Chan Roath was happy because high rank political officials, including the Minister of Education, Youth and Sport and a State Secretary, came. But when I enquired about the decisions which will follow, I was told that the Minister only said that he will study what could be done, he did not make any commitment. And it is clear that nobody will follow the project, asking the Minister to take action. The government is quite happy that NGOs are supporting the Master programs in different subjects, so there is no need for

him to contribute. That mathematics should be an exception is not easy to explain.

I wish that CIMPA will continue to support this program, but it is not obvious that this will be possible if there is no local support. The only local support which is given to the foreign teachers of the master program is that a tuk-tuk is freely available for the travels between the university and their hotel. I was told that this tuk-tuk is paid personally by the Rector, because he himself is keen to support the master program in mathematics. It would be impossible to use the budget of the university for such a support. This anecdote of the tuk-tuk seems to be rather well known in the academic circles in Phnom Penh and does not contribute to a positive reputation of RUPP.

The first mathematician from the young generation to receive a PhD has been Seam Ngonn who graduated from Pau (France), the second one will be Ou Pichhang who will graduate next summer (2012) from the [University of Shanghai for Science and Technology](#). Hopefully, there will be many more in the coming years. But when they come back to Cambodia, these young doctors will not be paid to teach in the Master program; if they do so, it will be either on a volunteer basis, or with other funds. Seam Ngonn told me not to expect that the new doctors in mathematics will be devoted full time to the *CIMPA program*. I replied that this is not the *CIMPA program*, this is a Master of URPP. And this is how he told me the situation which I just described.

Meas Len was selected to participate to a CIMPA Research School in Lahore in February 2012, but he did not join, because he was not allowed to. He had to teach, and he was told that he will lose his position if he leaves the country. Dy Chan Eng received a Master from the University of Education (besides his Master degree in Mathematics from RUPP), he was supposed to teach at least one year, but instead he went to Vietnam and followed the Master 2 courses in the Institute of Mathematics of Hanoi. As a consequence, he lost his Master of Education, and he lost his position. Now he is giving private courses but he has no academic position. This is the kind of situation which is not acceptable, but the decisions to change the system need to come from the highest level. And this is how the annual international conferences should be useful: foreign scientists who come to Cambodia for the above mentioned annual International Conference¹ should explain to political leaders in Cambodia that science needs to be developed and supported. These young students are to become the driving forces of the country, they should be supported instead of being harassed.

The government is going to issue general rules for the status of the university teachers. It will include research among their duties, which may be an important positive step, provided that financial support is given at the same time to make such decisions efficient.

For the situation to improve, I see two possibilities: one is that we consider impossible to change the way the government is acting, we agree to support fully this Master program without any local support, and we try to find enough funds – we may ask [ISP](#). The other way is to convince the government that he is not acting in the right way - for that, the

¹ Another opportunity could be the ICMI meeting on *The Mathematical Sciences in the Developing World* scheduled in November 2013 in Phnom Penh by the [Capacity & Networking Project](#) (CANP).

annual international conferences organized by Chan Roath could be useful (otherwise I see no utility in them: so far, there is no report, no feed back, no concrete consequence, as far as I can see).

To give up with this program does not seem to me to be something reasonable to plan: there is a high demand from the students, they deserve to be supported and I wish the program continues, in one way or another.

Now this program is really international, including the contributions from

- the [Centre International de Mathématiques Pures et Appliquées](#) (CIMPA),
- the [Volunteer Lecturer Program](#) (VLP), developed and sponsored by the Commission for Developing Countries of the International Mathematical Union (IMU),
- the [U.S. National Committee for Mathematics](#),
- the [Agence Universitaire de la Francophonie](#) (AUF),
- the [French Embassy](#), Phnom Penh,
- the [International Society for Education](#) (Toyota Foundation, Yasuo Morita)
- the [Abdus Salam International Center for Theoretical Physics](#) (ICTP).

Further information is available on the [CIMPA web site](#) dedicated to the South and East Asian activities. Hence there are good chances that the international support will be long enough until a sufficiently large number of young mathematicians from Cambodia come back to their countries with a PhD and take the lead in view of building a research school of mathematics.

A last comment on [ITC](#): a number of mathematicians who participate to the teaching program of Master in URPP would be ready to take the opportunity of their visit to contribute to the teaching program in ITC, either by giving lectures, or sharing a course with a local teacher. In a few cases this has already been done. The contacts I had with ITC show that such possibilities deserve to be investigated further and implemented.

• **Thanks**

This was the shortest of my visits to Cambodia; I am coming here almost every year since 2005. A number of things have changed during this lap of 7 years. As far as the situation of mathematics is concerned, the most dramatic change is the number of young mathematicians pursuing their studies in different institutes outside Cambodia. Something which did not change is the remarkable hospitality of the Cambodian colleagues involved in this program; I am thankful to them for the kindness with which they took care of making my visit enjoyable. Thanks also to Michel Jambu and Brigitte Lucquin who coordinate this program. Thanks also to Claire Luke for the copy of the article *Conference highlights the country's math deficiency* published in *The Cambodia Daily* dated March 5, 2012.

April 12, 2012, *Michel Waldschmidt*

Annex: URL

- CIMPA–RUPP Master Training Program
CIMPA website: Centre International de Mathématiques Pures et Appliquées
<http://www.cimpa-icpam.org/>
<http://www.cimpa-icpam.org/spip.php?rubrique47>
- RUPP web site
<http://www.rupp.edu.kh/master/mathematics/mathematics.php>
- My web site
<http://www.math.jussieu.fr/~miw/enseignement.html>
<http://www.math.jussieu.fr/~miw/cooperations.html>
- Institut de Technologie du Cambodge, ITC
www.itc.edu.kh
- Agence Universitaire de la Francophonie (AUF)
<http://www.auf.org/bureau-asie-pacifique/>
- The Southeast Asian Mathematical Society (SEAMS)
<http://www.seams-math.org/>
- Summer Program in Mathematics (SPIM) 2012 , HRI, Allahabad
<http://www.hri.res.in/~spim/2012/index.html>
- Paris Graduate School of Mathematical Sciences (PGSM)
<http://www.sciencesmath-paris.fr/pgsm/index.php?page=27>
- International Science Programme (ISP)
<http://www.isp.uu.se/>
- Workshops “Finding Online Information in Mathematics”
<http://workshop.ems-cdc.org/>
- The Fifth International Conference on Science and Mathematics Education in Developing Countries
<http://www.cambmathsociety.org/conferen1-3-March-2012.htm>
- The Volunteer Lecturer Program (VLP), developed and sponsored by the Commission for Developing Countries of the International Mathematical Union (IMU)
<http://www.mathunion.org/cdc/volunteer-lecturer/>
- The US National Committee on Mathematics
<http://sites.nationalacademies.org/PGA/biso/IMU/index.htm>
- The French Embassy, Phnom Penh
<http://www.ambafrance-kh.org/>
- The International Society for Education (Toyota Foundation, Yasuo Morita)
<http://sfi-npo.net/ise/english/e-directors.html>
- The Abdus Salam International Center for Theoretical Physics (ICTP)
<http://www.ictp.it/>

NATIONAL

Conference Highlights the Country's Math Deficiency

BY CLAIRE LUKE
THE CAMBODIA DAILY

Education experts and professors from around the world gathered over the weekend in Phnom Penh to discuss ways to strengthen mathematics in Cambodia and other developing countries.

Presenting on topics ranging from implementing lesson plans to using a graphic calculator, representatives from 26 countries attended the International Conference on Science and Mathematics Education in Developing Countries at Zaman University.

Chan Roath, president of the Cambodian Mathematical Society, said he hoped the conference would help bolster the field of math, which he said was crucial for Cambodia's development. No mathematics PhD programs exist in Cambodia. Only four Cambodians currently hold doctorate degrees in the subject, while there are just two master's degree programs in the country, both which are equivalent to Bachelor's level courses by international standards.

"Cambodia is far behind other countries in mathematics education quality," Mr. Roath said. "The government never used to consider it a priority, but this conference has attracted more attention to mathematics."

The primary reason for the poor state of affairs is low teacher salaries, Mr. Roath said. "They don't teach properly and aren't motivated to do research."

In the nationwide primary-level mathematics examination in July, only 53 among 90,000 students earned an A grade.

But the problem is not a lack of student capability, said Lin Mongkolser, a mathematics teacher at the Institute of Technology of Cambodia. Mr. Mongkolser said a lack of funds, educated faculty, facilities and demand are major impediments to the success in the subject.

"Math isn't popular in Cambodia because most students think they can just teach after a BA or MA [in mathematics]. In other countries, you can work for a company or banks after [earning a mathematic degree]," he said.

And the situation reflects poorly on Cambodia, Mr. Mongkolser said, noting that aspiring mathematicians have to go abroad to realize their potential. In order to break the cycle, he urged those students who earn a PhD in mathematics abroad to return to Cambodia to teach.

Deputy Prime Minister Sok An, who met with a delegation from the conference, said that the government will assist in finding sponsorship to increase mathematics teachers' salaries, develop math curricula and update teaching methods with new technology and textbooks.

Mr. Sok An's promise of funding amounted to the most interest the government has exhibited so far, Mr. Roath said.

"This is something countries like China and India have understood," said Michel Waldschmidt, a mathematician who was vice president of the International Center for Pure and Applied Mathematics when it established a mathematics master's program at the Royal University of Phnom Penh in 2007.

"Mathematics are everywhere, especially in technology, and a country cannot be economically successful without...good mathematicians," Mr. Waldschmidt said.

Ana Ferreras, who works to secure scholarships for students seeking to earn degrees abroad, said at the conference that math is the basis of the country's development and leads to many career opportunities, including engineering, architecture and finance. Mr. Roath agreed: "A lack of attention to mathematics is hindering the country's economic and technological advancement."

— National Brief —

Cambodian, Indonesian Foreign Ministers to Meet

Foreign Affairs Minister Hor Namhong will meet with his Indonesian counterpart today during a visit to Phnom Penh, according to a statement from the Foreign Affairs Ministry. The statement makes no mention of what Marty Natalegawa and Mr. Namhong plan to discuss. Bernard Sinaga, second secretary at the Indonesian Embassy, said he had no information about Mr. Natalegawa's schedule or his plans for the visit. Mr. Natalegawa played a key mediating role after renewed border fighting between Cambodia and Thailand broke out in April last year, helping to work out a plan that would see Indonesian observers monitor a cease-fire around the disputed territory and an anticipated troop withdrawal. The Thai and Cambodian defense ministers subsequently adjusted the plan so that all three countries would contribute personnel to the observer team, but have yet to set a date for their deployment or the troop withdrawal. Cambodia took over the chairmanship of Asean from Indonesia in January. The regional body's Committee of Permanent Representatives met in Phnom Penh yesterday. (Zsombor Peter)

World Vision

Film at Printer

ភ្នំពេញ ខ្សែរទេះ រោងចក្រ ហ៊ីប