

## **Report of Cambodia visit January 15-17, 2006**

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One among an infinitude of consequences of Cambodia's recent tragic history is the complete loss of its teachers of mathematics, their being members of the educated class, a class particularly targeted for annihilation by the Khmer Rouge government. The scope of this particular consequence of the deaths of some 20% of the Cambodian population may pale in comparison to many others, but this is the one that falls within the domain and the reach of the world's mathematical community.

The current situation is that teachers of mathematics in Cambodia at the secondary level themselves often have little more than a secondary education in the subject, and these teachers attend only to the 25% of young people of high school age who actually attend secondary school. Again at the university level, typically professors of mathematics themselves have only an undergraduate level of mathematical training, often consisting primarily in the ability to manipulate the mechanics of calculus and linear algebra. Cambodia currently has a total of 2 doctoral level mathematicians (Dr. Chan Roath, my host, and Dr. Chan Porn, head of the newly formed Cambodian Mathematical Society). Both, being counted among the very few intellectual leaders of the country, are required to occupy high positions in the government's Ministry of Education for lack of others capable of making policy for mathematics and its teaching. Even the existence of the Cambodia Mathematical Society itself seems to derive in significant measure from the continuing personal determination and energy of Dr. Chan Roath.

In response to the need to rebuild the possibility of the Cambodians to learn, teach and use mathematics for their country's development, a beautiful project of international cooperation has been created over the last few years by France's International Center for Pure and Applied Mathematics (CIMPA), under the direction of Professor Michel Jambu of the University of Nice, and with the internal leadership of Cambodia's one Ph.D. in pure mathematics, Dr. Chan Roath.

If resources can be raised internationally, CIMPA hopes to begin a small parallel initiative in nearby Laos, where the needs are equally overwhelming.

The Cambodian project to-date consists of two components. The first includes 3-week short courses delivered in Phnom Penh to about 40 Cambodian university professors and secondary teachers of mathematics. In 2005, there were 4 professors (including Professor Jambu himself), all from France, who went to Cambodia and each gave a 3-week course. In 2006, CIMPA plan to give at least 4, perhaps as many as 5 or 6 such courses. The first of these, by Professor Jambu, had just finished at the time of my visit. Typically the students are young, having only recently completed their own formal education, always in Cambodia, since there is neither the level nor the resources for study abroad. The 20 or so secondary teachers in these courses must find substitutes to teach for them and take half-salary (of a tiny whole) for the duration of the courses. But they are driven to continue their learning, particularly inspiring in the current period in which, in Cambodia as elsewhere, the young educated class is turning away from mathematics and the

sciences in favor of business, the law, and other professions which promise a far higher standard of living for them and their families.

A second aspect of the CIMPA program, which also has some financial support from the IMU and the French AUF (Agence universitaire de la francophonie), sends a handful of particularly capable students to CIMPA workshops elsewhere in Asia.

Needless to say, these indispensable and inspirational efforts cannot even begin to meet the mathematical needs of this impoverished country with a current population 17 million, most of them young. Regional partners, such as Vietnam, are a potential resource, but their mathematicians have much to attend to on the home front and very limited resources with which to work.

In the wider region, Japan has become a central resource through the Japan International Cooperation Agency (JICA), which runs a program for the professional development of secondary mathematics and science teachers in Cambodia. Cambodian coordinator for mathematics of the Japanese secondary project is Mr. Koji Takahashi of the JICA Cambodian office.

A World Bank loan is currently building 400 new secondary schools in the country, but the question of who is going to teach mathematics in those schools remains unaddressed. Cambodian coordinator of this project is Charis Weurfell of the Cambodian office of the World Bank.

An indication of the dire need and the importance that is placed on it was the attention given to the newly formed Cambodian Mathematical Society and to Professor Jambu and me personally by high officials in the Cambodian government. In fact, the first day and one half of my 2-day visit consisted in meetings with Cambodia's (very dynamic) Minister of Education, Dr. Kol Penh, an audience with the Deputy Prime Minister of Cambodia, Sok An, an audience with the King of Cambodia, Norodom Sihamoni, as well as the convening of the second meeting of the Cambodian Mathematical Society, the administrative part of which was attended by several middle-level government officials. It was only on the morning of the last day of the visit that a mathematical agenda, a meeting on 'The Uses of Mathematics,' was addressed. And even this meeting yielded to the political necessity of sizable opening addresses by government officials.

The nature of the topic for this meeting is again indicative of the country's circumstance. Four of the foreign visitors were asked to give talks which illustrated the need for mathematics and its study in the modern, technological world, indicating that that case was not yet made, even among the select audience of 100, drawn from the country's best mathematics students, professors and teachers. The level of the talks was also symptomatic. Nothing beyond an elementary knowledge of calculus, together with rudiments of linear algebra (matrix multiplication) could be drawn upon because mathematical formation in Cambodia goes no further and reaches no more broadly.

A highlight of my visit was a one-hour visit to the students in the CIMPA program.

Most of the 40 students were present and each told a bit about his [sic] background and aspirations. The humility of circumstance and the efforts and sacrifice required to participate in the program were reduced to insignificance in their view by the desire for advanced training in mathematics and the desire to contribute to the rebuilding of the country. I was reminded of similar inspiring encounters, recently in Cameroon and, in my early years, in Chile.

So there is much to be done. But there is also much that can be accomplished, at very little cost, in this country with a rich cultural history and tradition. Though corruption is widespread (even in such things as the grading of national placement exams in mathematics), the will to sacrifice and work are present in abundance in this mostly young society. The deep respect for past and present quantitative achievements of the human intellect has somehow been passed down, despite genocide and tyranny. The desire to rebuild the country is everywhere, and the longing to achieve parity with the regions of other fast-developing neighbors, such as Thailand and Vietnam, is palpable. They realize that one of the many essential ingredients of that progress to parity is good mathematical training and development, which in turn requires good mathematical infrastructure.

CIMPA needs considerably more support from mathematicians and mathematical organizations in other countries to scale up its program to meet the needs of Cambodian students. In an effort to help, the IAS/Park City Mathematics Institute is applying to the World Bank for funding to organize its style of “integrated summer school” for mathematicians and teachers in Cambodia, Laos and Vietnam within the next few years. To make permanent change, though, ongoing support of the wider, international mathematical community is called for. The natural conduit for that support is IMU and ICMI, which are called to configure themselves so as to be able to:

- 1) articulate the case for help for the Cambodian rebuilding from the international mathematical community,
- 2) locate financial and human resources,
- and
- 3) occasionally, when appropriate, even coordinate some significant activity in support of mathematical development.