Theme 1: Evelyne Barbin, University of Nantes (France)

The Implicit and Explicit Epistemologies of Mathematics in History and Education: thirty years after Hans Freudenthal.

In the International Congress of Mathematicians of 1983, Hans Freudenthal chose to speak on "The Implicit Philosophy of Mathematics History and Education". His purpose was to convert the question "what we can learn from the history of old mathematics for the sake of teaching young people? " into that of " what can we learn from educating the youth for understanding the past of mankind?".
With this purpose, Freudenthal meant that, behind any reading and trying to understand the history of mathematics, there exist interpretations, which are linked to implicit or sometimes explicit epistemologies which guide the reader. So, we are placed in the field of hermeneutics.
In the talk, we will explain why we replace philosophy by epistemology and why epistemologies and not epistemology. We will try to give a survey of epistemologies underlying our understandings of history and history with its relations to education. We will use recent literature on HPM to illustrate our talk, which have to be considered only as an introduction to the workshops based on original or historical texts.

Themes 2 & 3: Adriano Dematte, Universirty of Genoa (Italy)

History in the classroom: educational opportunities and open questions.

Using the history of mathematics in everyday classroom activities is difficult because of various reasons, but is an intriguing aim. The lecture will report examples of activities from my classes, in order to analyze resources and problems, achievements and failures.
With the aim of carrying out a critical analysis, theoretical considerations will be taken into account for discussing questions like the following: Can hermeneutics and genetic approach coexist? What kind of interdisciplinary competencies does history of mathematics improve? What types of students can benefit from it or, on the contrary, what supplementary difficulties can it produce? Which restrictions depend on curricula?
Ultimate answers to the above listed questions are not aims of my analysis. The purpose is to introduce an ongoing discussion that regards complexity of everyday classroom activities.

Theme 4: Cécile de Hosson, University Paris 7 (France)

Promoting an interdisciplinary teaching through the use of elements of Greek and Chinese early cosmologies.

Most of the curricula, at an international level, encourage an interdisciplinary approach for the teaching of both mathematics and sciences. In this context, interdisciplinarity is often promoted as a fruitful way of making students aware of the actual links existing between mathematics and sciences. As an example, the third pillar of the French *common base of the knowledge and skills* for primary and lower secondary school claims for "concrete and practical approaches to mathematics and sciences" that should allow students acquire the "scientific culture needed to develop a coherent representation of the world and an understanding of their daily environment" and help them grasp that "complexity can be expressed in fundamental laws" (MEN 2006). Here, mathematics and experimental sciences are considered altogether in a global enhancement project of the scientific culture.
Nevertheless, nothing is easy about effectively integrate mathematics and science in the classroom since the disciplinary isolation of the two disciplines in the traditional teaching organizations has to be overcome. Indeed, in most cases, the separation between science and mathematics is rigorously maintained and the boundaries are rather drawn even in primary school where the teaching is assumed yet by a unique teacher. Moreover, mathematics and science education lack of teaching-learning sequences leaning on interdisciplinary approaches that aims the learning of both mathematical and

scientific knowledge and skills but when they are performed they tend to show that even young students are able to acquire skills in the domains of mathematics, science, and scientific processes such as measuring, modeling, etc. The lack of teaching resources of that kind may be puzzling if one considers the interrelations between science and mathematics in their historical developments. In this regard, history of science can thus be considered as an inspiring ground for the elaboration of teaching sequences where mathematical and scientific knowledge and skills are integrated.
In this lecture we will present an example of such integration through the use of two distinct historical episodes dealing with Greek and Chinese early cosmologies. From these cosmologies a teaching sequence (involving historical elements miked-up with non-historical ones) was elaborated in order to provide students with elementary cosmological knowledge dealing with scientific and mathematical knowledge and skills (quasi-parallelism of Sunrays, shape and size of the Earth, Sun-Earth distance, measuring and computing, etc.). After presenting the results of the actual implementation of the sequence, this lecture will end with the statement of open-questions of two kinds that could be discussed and illustrated in the workshop: To what extent the interdisciplinary approach promoted by a teaching sequence based on historical ground modifies the views that students usually have on the nature of the science enterprise? What is the specific gain of the historical approach for the acquisition of the knowledge involved? Is it possible to define conditions of use of the historical material that promote an interdisciplinary mathematics-science approach?

Theme 5: Kristin Bjarnadottir, University of Iceland (Iceland)
Calendars and currency – Embedded in culture, nature, society and language

Ethnomathematics has become a prosperous and fruitful field of research. It has contributed to the greater objective of prioritizing the human being and his dignity as a cultural entity by recognizing and respecting the individuals' roots.
All over the planet people have been trying to learn about and cope with their environment, developing their ways of knowing. Throughout history, individuals and peoples have created and developed instruments for reflection and observation in order to explain, understand, come to know and learn to do in response to the needs for survival (d'Ambrosio, 2001). Many instruments have survived in the culture of their societies, embedded in customs and languages. In the presentation, examples of calendars in different societies, as well as currencies, will be presented and their reflection of nature and societal structure in the cultures and languages in which they are embedded will be demonstrated. Examples will be chosen to promote teaching ideas about mathematical topics in the participants' respective cultural environments.

Theme 6 : Gert Schubring , University of Bielfeld (RFA) and UFRJ (Brasil)
New approaches and results in the history of teaching and learning mathematics

Studies on the history of teaching and learning mathematics did not begin in recent times; rather, there were already a number of books and various types of papers published during the 19th century. The work of IMUK since 1908, the forerunner of ICMI, meant a considerable impact for historical investigations. First doctoral theses on the history of mathematics teaching date from the early 20th century. After World War II, pertinent studies were undertaken in ever more countries. Yet, practically all the studies were undertaken within the history of some nation or some culture. They were thus bound to the respective traditions, methodologies and approaches of national educational history.
Since the establishment of a Topic Study Group dedicated to this research area, at ICME 2004 in Copenhagen, and since the foundation of the first international Journal for this area, IJHME, in 2006, the focus has changed to address comparative and international issues in the history of mathematics education. At stake is since then to unravel what are general features in the national/cultural developments and what are specific issues and what is the significance of such particular patterns.
As particularly revealing have proved two issues of comparative international research:

- the processes leading to the decisive change of mathematics from a marginal teaching subject to a major discipline, first in secondary schooling;

- and, related to these developments, the emergence of *Mathematics for All* as a program and as a major shift in socio-politics of education;
- the role of mathematics in the modernization of various states, in particular during the 19th century, and thus showing the social relevance of mathematics.

The lecture will present methodological reflections, illustrative historical examples and perspective for further research.

Theme 7 : Bjarne Toft, University of Sothern Denmark (Denmark)
Julius Petersen and James Joseph Sylvester - the emergence of graph theory

Mathematics in Denmark was for centuries a rather sad story. Denmark is without world famous people in mathematics, unlike in physics and astronomy with Tycho Brahe, Ole Rømer, H.C. Ørsted and Niels Bohr, to mention the most famous. We would however like to think that things have changed and that mathematics in Denmark now does rather well. This being so, when did it change? It is of course difficult to point to a single year, but if we have to, then a good suggestion would be 1871. That year saw the appointment of two young friends at Copenhagen University and the Polytecnical School, Hjeronymus Georg Zeuthen and Julius Petersen. In their days Zeuthen was the clear number one , but today Petersen is probably the best known of the two. Petersen's claim to fame rests on his development of and contributions to two fields: elementary plane geometry and the theory of graphs. The story of how the theory of graphs emerged is an interesting piece of history of mathematics, involving James Joseph Sylvester, who visited Sweden and Denmark in 1889. This led to Sylvester's collaboration with Petersen and to Petersen's famous paper "Die Theorie der regulären graphs" in Acta Mathematica in 1891. Petersen used the English word "graph" in his otherwise German language paper, because "graph" is an English word that he learned from its inventor Sylvester (who by the way is also responsible for mathematical words like matrix, discriminant, and many more). The story of Petersen and Sylvester, put into a broad framework, will be the topic of this lecture.