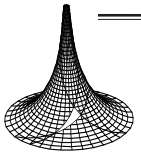

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Teaching
Mathematics and
Computer Science

Report on the Conference of

History of Mathematics & Teaching of Mathematics with Special Subject Ethno-mathematics

Research in History of Mathematics & Teaching of Mathematics University of Miskolc 18–21 May, 2006, Miskolc, Hungary

Compiled by TÜNDE KÁNTOR

Abstract. The 4th Conference on History of Mathematics & Teaching of Mathematics with Special Subject Ethno-mathematics was organized at the University of Miskolc (Hungary). The aim of the conference was to present aspects of the History of Mathematics and Ethno-mathematics, including its impact on the Teaching of Mathematics.

Its motto was: *Mathematics – a common language for Europe for thousand years.*

There were 21 presentations, a poster lecture (J. Kolumbán, University of Cluj, Romania) and an exhibition made by students of Eötvös University, Budapest (R. Tanács, K. Varga).

After a short historical introduction we present 19 abstracts and the poster lecture.

Key words and phrases: history of mathematics, ethno-mathematics, teaching of mathematics, history of mathematics in secondary school teaching, talented pupils, computer and teaching mathematics.

ZDM Subject Classification: A20, D20, N80.

About the History of Mathematics & Teaching of Mathematics Conference Series

The idea of the History of Mathematics & Teaching of Mathematics conferences came from Katalin Munkácsy (Teacher Training College of Eötvös University, Budapest). The first conference on History of Mathematics & Teaching of Mathematics took place in 2000 in Budapest with the support of the re-established Committee of the History of Mathematics in the János Bolyai Mathematical Society and an OTKA grant (2000). It was chaired by Professor Árpád Szabó, member of the Hungarian Academy of Sciences. In his opening lecture he emphasised the importance of the history of classical Greek mathematics for the teaching of mathematics. The participants were Hungarian, except David Lingard (UK). Its material appeared on a CD.

The second conference was held in 2002 (Budapest). It was devoted to the Bolyai bicentenary. It was chaired by György Ádám, chairman of the Hungarian Pedagogical Society and member of the Hungarian Academy of Sciences. In his opening lecture he focused on the psychological and philosophical background of learning and forgetting.

The third conference in 2004 was held at the University of Miskolc and became an international conference. The Organising Committee has been expanded and included Mathematics Institutes of the Universities of Debrecen and Miskolc. The chairman was Professor Gyula Maurer, and its members Péter Körtesi (University of Miskolc), Tünde Kántor (University of Debrecen), and Katalin Munkácsy (Eötvös University of Budapest). The participants were from several countries (Austria, Hungary, Portugal, Romania, Scotland, Serbia, Slovakia, UK, USA).The official languages were English and Hungarian. Gyula Maurer presented the opening talk on mathematical life in Transylvania until 1945. Philip Davis (UK) talked about the decline, fall, and current resurgence of visual geometry and the impact of various abstraction levels on the efficacy of mathematical instruction. David Lingard (UK) showed how we can apply the early Chinese mathematics for secondary school classroom. We have to mention the contribution of John O'Connor and Edmund Robertson (University of St. Andrews, UK), who made the well-known website of the History of Mathematics, the Mac Tutor (`www-history.mcs.st-andrews.ac.uk/` mathematicians).

This conference took place a few weeks after Hungary joined to the European Union, so its motto was: *Mathematics – a common language for Europe for thousand years.* On this conference appeared the Proceedings of the 3rd Conference

on the History of Mathematics & Teaching of Mathematics (Special issue of Octogon Mathematical Magazine, 2005, Miskolc-Brassó – Kronstadt-Brasov, Fulgur Publisher, ISBN 973-98342-7-2).

The fourth conference was held at the University of Miskolc in 2006. Cooperating partners were: János Bolyai Mathematical Society (Budapest), Department of Mathematics University of Miskolc, Department of Mathematics and Teacher Training College of the Eötvös University (Budapest), Kerekgedei Society of Mathematics Teachers (Budapest), Institute of Mathematics University of Debrecen, Faculty of Informatics University of Debrecen. The chairman of the Organising Committee was Prof. A. Galántai (Miskolc), and the members were P. Körtesi (Miskolc), T. Kántor (Debrecen), K. Munkácsy (Budapest), A. Tuska (USA). It was an international conference. The participants came from Belgium, Bulgaria, Hungary, Romania, Scotland, Serbia, Slovenia, UK, USA). In the opening talk Professor Aurél Galántai presented the life and work of Professor Miklós Hosszú (University of Miskolc).

P. Körtesi remembered to László Filep who died in 2004. At the second conference of the History of Mathematics & Teaching of Mathematics he was one of the invited speakers, he had a talk about Julius Pál and he wrote reports about the establishment of a History of Mathematics Committee in Hungary, and the Third Conference on the History of Mathematics. The fifth conference on the History of Mathematics & Teaching of Mathematics is planned to take place in 2008.

Now we present the received abstracts and the poster-lecture. They are neither proof-read by the compiler, nor was their language checked. Therefore every author is responsible for his/her own text.

Is there school of Hungarian mathematics?

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One of the latent myths of our science is that we have "school of Hungarian mathematics". The term suggests a specific tradition of historical and mathematical factors often hallmarked by *mathematical heuristics*. After considering further characters we are still left with the question: is a school determined by a finite series of characteristics? What kind of concepts are required and what are

the problems one has to be faced with on our way looking for an answer? The paper enlightens some empirical and historical research problems in the line of answers, and in addition to conceptual issues addresses some research hypotheses.

25 Years National Winter Mathematical Competitions

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This lecture presents the historical interest of ancient Bulgarians in Mathematics, the basis for establishing the National Winter Mathematics Competitions (NWMC), which includes competitions on problems in Mathematics, Informatics and Mathematical and Computer Linguistics, competition on creating new problems, papers, etc. The competition problems in Mathematics for 2006, 9–12 grades, and statistics of the winner level, grade 4 and grade 11 are presented too.

Making accessible for the Senior Secondary Level the hidden Mathematics in contemporary Science and Technology

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The observations that form the base of the talk have been made in several Western countries, and are twofold: first of all, the number of students that at the beginning of the senior secondary level is choosing a finality with some substantial part of mathematics, is decreasing; in the second place (and of course to some extent also a consequence of the former fact), the students that are finishing the secondary level and are continuing a (university or other) higher education form, have in the last decennia a decreasing interest for a higher education in a scientific discipline, even if they had a sufficient portion of mathematics at the senior secondary level. Both facts lead to some less desirable consequences. Hence, it seems to be necessary to do some effort in order to stimulate the interest

of the younger people for mathematics (and for sciences in general), and to bend the subjective resistance against sciences and technology to a healthy curiosity that forms the base of scientific research. In order to convince the younger people that mathematics is indeed a very dynamic and attractive science, we propose in the talk to awake the interest by a suitable mathematics curriculum at the senior secondary level, a curriculum that is based on a combination of mathematics from the past and its use in modern developments.

Zeno and the tortoise
Questions and answers on Árpád Szabó's theory of the history of ancient Greek mathematics

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The paper deals with a question left open by Á. Szabó's famous book on how ancient Greek mathematics became a demonstrative discipline. What the author tries to answer in the present paper is the question: why this turning point occurred and how it was brought about by the socio-historical circumstances given in (and only in) antique Greek polis democracy.

A New Solved Question in Connection to a Problem of Pál Erdős (II)

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In [1] appeared the following open question OQ14 due to Pál Erdős:

"If ABC is an acute triangle such that $a < b < c$ then $a+f_a < b+f_b < c+f_c$", where $a = BC$, $b = AC$, $c = AB$ are the lengths of the sides of the triangle ABC and f_a, f_b, f_c mean the length of the interior bisectors corresponding to the sides BC, AC and AB, respectively.

Indeed, if we try for "usual" acute triangles ABC, we can verify the validity of the Erdős inequality.

In [2] we realised to obtain an acute triangle for which the Erdős inequality is false.

Using the trigonometrical way combining with some elementary properties from algebra and mathematical analysis we showed that for this "extreme" acute triangle from $a < b < c$ results $c + f_c < b + f_b$.

In connection with the Erdős problem we formulated the following open question "if ABC is an acute triangle such that $a < b < c$ then $a^2 + f_a^2 < b^2 + f_b^2 < c^2 + f_c^2$.

In [3] we proved the validity of this statement.

Now in connection with these problems we formulate a new open question "if ABC is an acute triangle such that $a < b < c$ then $a^4 + f_a^4 < b^4 + f_b^4 < c^4 + f_c^4$."

THEOREM 1. *There exists an acute triangle ABC such that $a < b < c$ implies $a^4 + f_a^4 < b^4 + f_b^4$.*

THEOREM 2. *There exists an acute triangle ABC such that $a < b < c$ implies $a^4 + f_a^4 > b^4 + f_b^4$.*

Consequently from Theorem 1 and Theorem 2 we get that the answer for our open problem is NO.

[1] Open Problems, OQ.14, *Mathematical Magazine Octogon* **3**, no. 1 (1995), Brasov, Romania.

[2] B. Finta, Solution for an Elementary Open Question of Pál Erdős, *Mathematical Magazine Octogon* **4**, no. 1 (1996), 74–79, Brasov, Romania.

[3] B. Finta, *A New Solved Question in Connection to a Problem of Pál Erdős*, Proc. of the 3rd Conference on the History of Mathematics & Teaching of Mathematics (2004), 56–60, University of Miskolc, Hungary.

Miklós Hosszú (1929–1980)

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The lecture gives an overview of the scientific and educational activity of Miklós Hosszú emphasizing his teaching and its long standing effect.

On the Habilitation Lecture of Lipót Fejér

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"The concept of stability carries highly different contents even within the framework of mass point systems. It is no use arguing which one of them is the best since, except for some inherent features of it, stability as a popular concept is so definite and so relative that, owing to the variety of existing relations, stability definitions highly differing from one another may be formulated without getting into contradiction with the popular concept." (L. Fejér, June 23, 1905)

Computer Algebra and Teaching Mathematics

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Without abstract.

Famous mathematics teachers and their outstanding students from the early time of KöMal

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Hungary's KöMal was initiated in 1894 by a prominent schoolteacher D. Arany. His successors were L. Rátz and A. Faragó, who were also schoolteachers. It became an eminent high school mathematics journal which played a major role in the mathematical development of students with high ability. In it there were posed problems of different level of difficulty. They published the solutions of the solved problems written by the best students. Another part of the Journal was the articles written by teachers or students, which contained additional material of instruction.

In this lecture we shall present some unknown facts about and letters from famous mathematics teachers and their outstanding students from the early time of KöMal (A. Faragó, M. Seidner, Zs. Maksay, A. Visnya, L. Fejér).

The Development of the Cluj/Kolozsvár School of Mathematics (A hundred years ago, even more...)

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It is remarkable that it was the University of Cluj, not that one in Budapest among Hungarian universities that first became an important centre of mathematics. In 1872, when the University of Cluj was established, the situation of mathematics was not promising at all. Apart from the activity of the Bolyais the mathematics literature of that time was quite poor here. Even so, during the decades, preceding the world war, the school of mathematics in Cluj became one of the best in the Monarchy. Its representatives gained imperishable merits for themselves and for the Hungarian scientific life. It is not probable that a week day passes without mentioning somewhere in the world the name of Gyula Farkas, Lipót Fejér, Alfréd Haar or Frigyes Riesz, whose activity had a great influence on the scientific development in the 20^{th} century and who all worked for a while at the university of Cluj. How did mathematics in Cluj reach so high at the beginning of the 20^{th} century? What personal conditions, social and economic facts, strategies aiming the scientific life and development of education contributed to this evolution? In this paper the author tries to answer these questions.

Hermite's rule surpasses Simpson's: In mathematics curricula Simpson's rule should be replaced by Hermite's

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For good education it is not enough to have well-organized lectures and well-conceived assessment. Especially for mathematics, it is important that we promote the understanding of mathematical concepts. Very important is also the subject which is being taught and the mathematical methods which are used.

In my manuscript I put forward my observations concerning Simpson's rule, usually included in the undergraduate mathematics curricula. In my opinion, far better than Simpson's rule is Hermite's rule, which simultaneously optimizes the teaching time ant the effort on reaching the desired goals-to achieve some knowledge and understanding in:

- numerical integration
- numerical summation
- estimation of several (finite or infinite) sums and products, for example factorials or Gamma function and similar.

QDA software in a study on the role of mathematics history in the mathematics classroom

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QDA software in a study on the role of mathematics history in the mathematics classroom Computer aided qualitative research, using Qualitative Data Analysis (QDA) software is a new method of mathematics education's research. I would like to show a pilot study on teacher- student's views about the role of mathematics history in mathematics education. The data was gathered in pre-service teacher training, and they was analysed by HyperResearch software.

Measuring gravity with a Scottish mountain

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The talk will look at some work of the 18th Century English Astronomer Royal, Nevil Maskelyne, to calculate the universal gravitational constant by astronomical observations near the Scottish mountain of Schiehallion.
See http://www-history.mcs.st-andrews.ac.uk/mathematicians/Maskelyne.html.

The problem of the five years old János Bolyai and its generalization for a hypercube

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At an occasion of painting their room, the five years old János Bolyai observed that if the room is painted too many times, at the end there will be no room for the people. We present the illustration of this beautiful and very simple problem in Comenius Logo program language. We generalize the problem for a hypercube, but the problem will not be true if we embed the 3-dimensional cube into the 4-dimensional Euclidean space. Finally we analyze the methodical background of this beautiful problem.

The Scientific Achievement of József Detki, Professor of Mathematics at the Faculty of Civil Engineering in Subotica

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József Detki, PhD was the first professor at the Faculty of Civil Engineering in Subotica who earned scientific degree Doctor of Philosophy in the field of mathematics. He was interested in Mathematical analysis, especially in the Quantitative behaviour of solutions of differential equations. The topic of his PhD thesis was The Behaviour of Solutions of Ordinary Nonlinear Second Order Differential Equations. This field represents the core of his scientific achievements. Of course he studied other topics as well however he was especially interested in the oscillation and boundedness of solutions. This paper is aimed at presenting

his scientific results, highlighting his achievements and his endeavours in teaching mathematics for technical professionals.

The great Idea of Galois and some of its consequences

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The great idea of the French mathematician, E. Galois, to associate to an equation solving problem, the abstract notion of a group is step by step developed up to some of the main problems in today mathematics.

Caleb Gattegno: Contributions of an African Theorist and Innovator to Mathematics Education

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In the latter half of the last century, the epistemological theory and educational materials of Caleb Gattegno (1911–1988) revolutionized the learning and teaching of mathematics in classrooms in all continents of the World. In this presentation, I will trace Gattegno's biological roots in Africa and his ultimate journey to reside in Europe and North America. I pay particular attention to his various contributions to current understanding of human learning and the present day reform efforts in mathematics education.

P. G. Tait

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This talk considers the life and work of the important Scottish physicist and mathematician Peter Guthrie Tait and his interactions with some of his contemporaries including Maxwell and Lord Kelvin.

See `http://www-history.mcs.st-andrews.ac.uk/mathematicians/Tait.html`.

Teaching Geometry using Computers

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The thesis explains and describes computer aided teaching and learning, using the software Euklides from László István. We demonstrate the application possibilities of dynamic geometric systems by introducing the visualisation of the isometrics, and animation of the problems in teaching geometry. It proves that from the theoretical- axiomatic geometry in the teaching we as teachers should return to the classical drawings and sketching to get experiences and knowledge, to practice and get routine.

Trigonometric functions and computer

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In this paper the results of the questionnaire about examining trigonometric functions with or without the computer is analyzed. The tested students are talented for mathematics and attend Novi Sad High School. The aim of this test was to check the student's theoretical and visual knowledge of trigonometric functions at the end of their high school education.

How do prospective Secondary Teachers Plan to Use the History of Mathematics?

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The study of the history of mathematics is a required part of many secondary mathematics teacher preparation programs. The intent of such a requirement is that the prospective teachers will incorporate interesting historical facts, anecdotes, and historically relevant methods and investigations into their teaching practices.

This paper will analyze prospective teachers' ideas regarding the use of the history of mathematics in secondary level instruction. The basis for the analysis is the collection of project reports submitted by student groups at California State University, Fresno throughout the past ten years. Prospective teachers' plans will be compared with teaching practices and with the treatment of history of mathematics in selected American secondary mathematics textbooks.

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