Report on the Conference of
History of Mathematics and
Teaching of Mathematics

Research in History of Mathematics and Teaching of Mathematics

University of Szeged 19 – 23 May, 2010, Szeged, Hungary

Compiled by TÜNDE KÁNTOR

Abstract. The 6th Conference on the History of Mathematics and Teaching of Mathematics was held in Szeged (Hungary). Its motto reads as:

> *Mathematics – a common language for Europe for thousand years.*

The aim of the conference was to present aspects of History of Mathematics, including its impact on Teaching of Mathematics, to provide a forum to meet each other, and to give an opportunity for young researchers to present their results in these fields. University colleagues, students, graduate students and other researchers were invited. The programme of the Conference included talks and posters. The abstracts of the lectures and the posters are presented in this report. There were 24 presentations and poster lectures.

Key words and phrases: history of mathematics, teaching of mathematics, history of mathematics in secondary school teaching, computer and teaching mathematics.

ZDM Subject Classification: A20, D20, N80.

About the Series of Conferences on History of Mathematics and Teaching of Mathematics

The idea of Conferences on the History of Mathematics and Teaching of Mathematics came from Katalin Munkácsy (Eötvös University of Budapest).

The first Conference on History of Mathematics and 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 Budapest in 2002, devoted to the Bolyai bicentenary. It was chaired by *Professor György Ádám*, president of the Hungarian Pedagogical Society and member of the Hungarian Academy of Sciences. His opening lecture was 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 extended 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 different countries (Austria, Hungary, Portugal, Romania, 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 the visual geometry, about 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 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 and Teaching of Mathematics as a special issue of the 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. Co-operating partners were János Bolyai Mathematical Society (Budapest), Departments of Mathematics University of Miskolc, Department of Mathematics and Teacher Training College of the Eötvös University (Budapest), Kerekgedei Society of Mathematics Teachers (Budapest), Departments of Mathematics of University Debrecen, Faculty of Informatics of University Debrecen. The chairman of the Organising Committee was Professor *Aurél Galántai* (Miskolc), and the members were Péter Körtesi (University of Miskolc), Tünde Kántor (University of Debrecen) and Katalin Munkácsy (Eötvös University of Budapest) and Ágnes Tuska (California State University, Fresno, USA). It was an international conference. The participants came from Belgium, Bulgaria, Hungary, Romania, 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 László Filep who died in 2004. At the second Conference on the History of Mathematics and Teaching of Mathematics he was one of the invited speakers, he had a talk about Julius Pál.

The fifth conference was held at the Petru Maior University of Tîrgu-Mureş (Romania) in 2008. Cooperating partners were János Bolyai Mathematical Society (Budapest), Romanian Mathematical Society, Departments of Mathematics University of Miskolc, Junior Mathematical Society of Miskolc, Department of Mathematics and Teacher Training College of the Eötvös University (Budapest), Departments of Mathematics of University Debrecen, Faculty of Informatics of University Debrecen, Petru Maior University of Tîrgu-Mureş (Romania), Mureş County School Inspectorate (Romania), Sapientia University (Romania), University of St. Andrews (UK). The chairmen of the Organising Committee were *E. Robertson* (UK) and *Lajos Klukovits* (Szeged). Besides the talks there was a poster session too.

Tîrgu-Mureş is the city where *Farkas and János Bolyai* lived for a long time. The participants had opportunity to get acquainted with the memorial places of the Bolyais. They visited the famous *Teleki Library* and the *Bolyai Memorial exhibition*, where *Professor Tibor Weszely* presented letters and manuscripts of the Teleki Library. They walked to the Calvinist cemetery and laid flower-wreaths to the funeral stone of the Bolyais, and to the *Pseudosphere* monument. They visited the Palace of Culture too. This conference was international. The 60 participants of the conference came from Australia, Bulgaria, Croatia, Hungary, Romania, Scotland and Venezuela.

The sixth conference was held in 2010 in Szeged in the Hall of the Academic Center of Szeged. Cooperating partners were Bolyai Institute of the University of Szeged, Graduate School of the University of Szeged, School of Mathematics of the University of St Andrews, Department of Analysis of the University of Miskolc, Department of Mathematics, Teacher Training College of the Eötvös University Budapest, Institute of Mathematics and Faculty of Informatics of the University of Debrecen, János Bolyai Mathematical Society (Hungary), Junior Mathematical Society (Miskolc). The Conference was supported by the European Union and co-financed by the European Social Fund (Acknowledgement and dissemination of scientific achievements at the University of Szeged, TÁMOP-4.2.3.-08/01-2009-0015). The chairman of the Organizing Committee was *Edmund F. Robertson* (University of St Andrews), and the members were John O'Connor (University of St Andrews), Péter Körtesi (Miskolc University), Katalin Munkácsy (Eötvös University Budapest), Tünde Kántor (University of Debrecen), Lajos Klukovits (Bolyai Institute of the University of Szeged), József Kosztolányi (Bolyai Institute of the University of Szeged), Róbert Oláh - Gál (Sapientia University, Romania). The advisory board: Philip Davis (UK), Edmund Robertson (UK), John O'Connor (UK), Ágnes Tuska (USA), Péter Gábor Szabó (Institute of Informatics of the University of Szeged), Tibor Weszely (Sapientia University, Romania). Invited speakers were: Edmund Robertson, John O'Connor, Tünde Kántor, Ágnes Tuska, Katalin Munkácsy, Gudrun Wolfschmidt, Snezana Lawrence. This conference was international. The about 40 participants of the conference came from Albania, Bulgaria, Germany, Hungary, Ireland, Japan, Romania, Serbia, Slovakia, UK, USA. Some lectures of the conference appeared on a CD as Proceedings of HMTM, Szeged, 2010 May 20-22, ISBN: 978-963-661-929-9.
In that time came into action the Iceland volcano Eyjafjallajokull. In consequence of the volcanic eruption and the volcanic ash the airports of England were closed, so the participants from Scotland were not able to fly to Hungary. There was another environmental problem. In Slovakia there was high flood. In consequence of this some persons could not take part on the conference. They have sent their presentations or posters. We have seen the videotaped lectures of Edmund Robertson (Galileo's Difesa), John O' Connor (What Archimedes knew about continued fractions), Colin Campbell (The Edinburgh Mathematical Society Education Committee) and Daniel Mintz (Mathematics for History's Sake. A New Approach to Ptolemy's Geography). It was very interesting that with a sky connection, by the help of a web camera, we could speak with them and we could make a discussion after the talks.

Abstracts of the talks and posters

Now we present the received abstracts. They are neither proof-ready by the compiler, nor was their language checked. Therefore every author is responsible for his/her own text. Abstracts of the talks and posters follow in alphabetical.

A historical overview of the influence of technology on mathematical competition

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We provide an historical overview of how advances in technology influenced high school and university mathematical competitions in the USA and at the International Mathematical Olympiad. While students are not allowed the usage of technological aids during mathematical competitions, the developments in technology (specially graphing technology) throughout the past century and the increasing employment of such aids in the classroom have affected both the nature of proposed problems and their expected solutions. We examine several interesting examples from competitions going back several decades.

The lessons that struggling mathematics students can learn from the History of Mathematics

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In this paper we will identify and discuss four techniques for equation solving in the History of Mathematics. We will discuss the benefits that exposure to these areas can bring to students of Mathematics and in particular to students who struggle with Mathematics. In general these are students who have little or no exposure to the History of Mathematics and this lack of context and background is one of the issues that have been identified as key in addressing the current crisis in Mathematics education. The four approaches we will look at are; the Egyptian 'method of false position'; Babylonian solutions to simultaneous non-linear equations; an Arabic geometric solution to certain cubic equations; Cardano and Tartaglia's solutions to equations and the subsequent development of imaginary numbers. The issues and problems dealt with in these (and other) developments in the History of Mathematics have many similarities to the well

documented concerns that struggling students deal with on a regular basis. We will discuss (using these four areas as a sample) how introducing struggling students to topics from the History of Mathematics can help them deal successfully with many of the problems they have with Mathematics. It is well known that students who struggle with Mathematics often think that they are the first or only person to have difficulties with these problems and thus rarely ask for help due to fear of embarrassment. They also often perceive Mathematics knowledge as an instant knowledge instead of something that can be worked out. We will show that by introducing them to these topics they can see that they are not alone in struggling with these issues. Furthermore, thinking about mathematics and trying to address their problems leads to success in understanding.

Experiment with a friendly at the age of primary school mathematics teaching logs

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In hours of mathematics we very often found with mathematical operations in definitions and tasks. It is important that these are properly interpreted and used. Suitable foundation is appropriate primary school ages should be started. On the basis of NAT (National Basic Curricula) the "no", "or" and "and" allegations are formulated and then deciding their truth value. The question now is on which way we do this? How we can offer tasks in the friendly form to children this?
I undertook to using computer, I develop a web-based animation, which fits the wording and the specific nature of the child's age and the world of imagination, and it includes the most common logic operations are used during their studies. Based on this conception two animations were born. One of these the Dwarves and the other is the Bear dam task. Animation - beside it is the education guide - is able to measure the number of correct and incorrect solutions. Thus getting a picture of the children logical mathematical way of thinking, and on the other hand I get a picture of the effectiveness of the tasks.

The Edinburgh Mathematical Society Education Committee

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The Edinburgh Mathematical Society, founded in 1883, is the principal mathematical society for the university community in Scotland. It has published Proceedings since 1884. Each academic year, the Society normally holds eight ordinary meetings from October to June terminating with the Society's AGM the following October. Among its other activities the Society has a Research Support Fund which gives financial support to a variety of mathematical activities, including research visits, conferences and publications. The Society also has an Education Committee which is concerned with the whole spectrum of mathematical education. In particular, this Committee manages the Schools Enrichment Fund to support a range of mathematical activities at school level. I will describe some of the work of the Education Committee of which I have been the convener for the last three years.

What Archimedes knew about continued fractions?

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When Archimedes needed good bounds for $\sqrt{3}$ to start his calculation of $\frac{1}{4}$, he chose (without explanation) $\frac{265}{153} < \sqrt{3} < \frac{1351}{780}$. These mysterious fractions, which historians have long speculated on, are among the convergent in the continued expansion of $\sqrt{3}$. Just how much did Archimedes know about continued fractions?

Nationwide Assessment of First Year Engineering Students in Mathematics in Hungary, 2009

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Professors and lecturers involved in programs in engineering or in natural sciences in Hungary often experience that students entering higher education have a weak background in Mathematics, Physics, and Chemistry in the past few years in Hungary. Lately separated pilot programs were launched by different institutions for assessing the level of knowledge of freshmen starting their studies in these three subjects. In 2008 the Engineering Committee supervised by the Panel of Presidents and Rectors of Hungarian Universities proposed to extend the project to national level. The goal is to assess the background of students starting programs in engineering in Mathematics, Physics, and Chemistry. Universities running programs in natural sciences also joined the project in 2009.

The coordinator of the project in Mathematics was Budapest University of Technology and Economics, strongly supported by Eötvös Lóránd University. The purpose of the program was to obtain data about the Mathematics knowledge of students that is thought to be essential by professors in higher education. Thousands of students from different institutions took part in the assessment project. The students took the test during the registration week at the beginning of the fall semester of 2009. Based on the results consequences can be drawn about how well secondary education in Mathematics meets the requirements of higher education in Hungary. Conclusions concerning inconsistencies of the admission system of Hungarian higher education also will be presented. This paper presents the results and summary of the Mathematics assessment project. The talk highlights the aspects of the assemblage of the proposed Mathematics test, and summarizes the experiences of the project.

Smaradache's Type Functions

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In the theory of numbers there are well known Smarandache's functions and some similar functions of type Smarandache. There exists wide mathematical literature in connection to Smarandache's functions on the internet, but we can mention special mathematical journals as Smarandache Function Journal, Smarandache Notions Journal, Octogon, Mathematical Magazine. Historically that kind of function was first considered by Lucas (1883), followed by Neuberg (1887), and Kempner (1918). It was rediscovered by Smarandache in 1980.

The Smarandache's function $S : N^* \to N^*$ is defined by the rule: for every natural number $n \in N^*$ let be $S(n) = m$ where $m \in N^*$ is the smallest natural number so that n divides $m!$, i.e. $n \mid \prod_{k=1}^{m} k$.

In one of advanced problems in the American Mathematical Monthly set in 1991, and solved in 1994, Pál Erdős pointed out that the function $S(n)$ coincides with the largest prime factor of n for "almost all" n (in the sence that the asymptotic density of the set of exceptions is zero). In this paper we recall some familiar functions of type Smarandache, which were introduced by us and their properties were studied in some licence works of my students.

Contribution to the History of Hungarian Mathematics, Ottó Varga (1909-1969)

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In this talk we want to present Ottó Varga's life, work and influence. He was an outstanding Hungarian geometer and the head of the Mathematical Seminar/Department (1942-1959) of the University of Debrecen (Hungary). He wrote 57 papers.

His areas of research were differential and integral geometry. He was student in Prague and he was PhD student of Ludwig Berwald. Later he studied at Wilhelm Blaschke in the famous Hamburg School of differential geometry.

He taught differential geometry, projective geometry, non-Euclidean geometry and descriptive geometry at the University of Debrecen and at the Technical University of Budapest.

He laid the base of the Debrecen School of differential geometry.

The Trend of the Teaching of mathematics in the Last Years, the Effects and Consequences of the Nation-wide rate Measuring to the Preparing of Extra-curricular Documents

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We have to handle the incomplete knowledge in the tertiary education which was carried from the secondary school. During the passed years we experienced that the knowledge of the students are getting worth. In the educating of the mathematics we had to take into consideration these deficiencies because we couldn't teach the required school-work to the students. It was needed to measure the knowledge of the underclassmen. By the help of the measurements' data managed to waking up the managers of the secondary schools, teachers and the tertiary education that the teaching of the mathematics has to straggle against serious problems and cannot come by without a word.

According to the initiating of the Budapest University of Technology and Economics took place the first measuring of mathematics and physics in the first semester of the term 2009/2010 in nation-wide. The aims of the 2009 examination were to examine that what kind of knowledge have the students who enter

the tertiary education. The knowledge of the students is getting worth and defective. Now we clearly know the knowledge of the students and according to it we can form the school-works and teaching methods. We began to develop new extra-curricular documents at our college (theme of analysis and numerical methods) and with its help should make understandable the mathematics of the tertiary education. We should attract the attention of the young people by computer programs, visual graphics and interactive programs. We prepared the extra-curricular documents with the help of the GeoGebra program, which should download free. We would like to apply and develop these programs in the school work of the e-learning subjects.

The Albanian Mathematicians by the Flowside of the Mathematicians of the World
(poster)

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There is an enormous number of mathematicians , great and little, well-known and known throughout the world, in Albania as well. While in Albania are well-known all great mathematicians and many other mathematicians I have noticed that none of the Albanian mathematicians is found in the main enciclopedies or web-sites of the world! I have had opportunities to see several world enciclopedies but I have found none of the Albanian mathematicians. Sure, can be found some great historical figures of Albania from the ancient world to the present time, even the names of cruel persons(this is ridicilous). But, how is it possible that no name of an Albanian mathematician is there? How is it possible that the names of those who have worked so hard during all their life to translate math textbooks and works of great mathematicians and to adapt them for the education system of Albania and, who are well-known for their mathematical creative work in Albania, are not found in such scientific volumes of the world? I was searching on internet if I could find one name and, surprisingly I found the name of an Albanian “mathematician” but one second joy only, he is a politician. Recorded as mathematician because, before becoming a politician he used to teach math in a school!!! He is not part of the mathematical creme in Albania. Does someone think that all that mathematical seed sown in Albania in different times, in different ways and by different sowers is dried out? Is not true that some seed fell on good ground and yilded a crop: some a hundredfold, some sixty and

some thirty? Yes, of the Albanian nation are yilded mathematicians but they are not known outside Albania. This observation shows three things:

(1) The Albanian mathematicians have really worked so hard that they have not had time to think for presenting themselves to the world.

(2) The mathematicians worldwide are distinguished for the spirit of humbleness and diligence.

(3) Such world platforms(enciclopedies, historical books, etc.) in Albania are still arena of politicians.

With this paper I want to make a little contribution by merging the little stream of the Albanian mathematicians with the global stream of the mathematicians of the world.

On the Arabic Books of Diophantus' Arithmetica
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Diophantus of Alexandria lived around 250 AD. His treatise Arithmetica dealing with the solution of determinate and indeterminate equations, consists of 13 books originally. In Greek only 6 books are preserved, and printed in several times later. It was translated into Latin by the famous maestro Tartaglia, e.g. one edition of this translation contains the well known sentences of P. Fermat.

G. Toomer (Brown Univ.) in 1973 learned of the existence of just published catalogue of mathematical manuscripts in the Mashad Shrine Library (Iran). Reading this catalogue he find an Arabic translation (by Qusta ibn Luqa, died in 912) of a Greek treatise.

It proved to be a treatise of Diophantus of Alexandria. Toomer's graduate student J. Sesiano carefully examined this manuscript, and proved that it must to be lost parts of the Arithmetica. Sesiano claimed that these 4 Arabic books — contain 101 problems — can be placed between the known Greek/Latin books. If we sign the Greek books by A, B, Γ, Δ, E, Z and the Arabic books by 4, 5, 6, 7, then the correct order is A, B, Γ, 4, 5, 6, 7, Δ, E, Z. In the talk we present selected problems from the Greek/Latin books and from the Arabic books. Here we mention two of them only. A problem from Book Γ reads as: Find three numbers such that the products of any two of them increased by a given number yields a square. A problem from Book 7: We wish to find a square number of

cubic side such that the addition to it of a certain number gives a square, and also the addition to it of twice this number gives a square.

Manuscripts of János and Farkas Bolyai - unexplored source

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The Teleki Library in Tg-Mureş (Marosvásárhely) keeps over 20 000 manuscript pages of the two Bolyais, father and son, but only about 20% have been explored by the ongoing research. The reasons are multiple, most of them well known: the manuscripts are in different languages - beside Hungarian, there are Latin, German pages, before being deposited in the museum they were first inspected by the Austrian army, then kept in bad conditions in the Calvinist college, part of them were transported to Budapest for a period. However the most important difficulty in deciphering them is the special writing of János Bolyai, the special letters, and writing introduced by him during he started developing his philosophy, the ÜDVTAN. We plan to start a project in joint work with the museum and the Bolyai Group Tg-Mures to use ITC technique to enhance the research of the manuscripts. We will try to identify the chronology of the manuscripts following the development of the characters introduced by János Bolyai, and to use the existing text transcriptions to create further ones.

Using GeoGebra for Representing Special Curves

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Beside the applications in Geometry, the dynamical interactivity of the two windows, the Geometry and Algebra windows of GeoGebra makes it extremely suitable for the applications in representing functions. Using the animation, a function which is built in the slider - an extremely useful function of the software - one can study the transforms of the elementary function, the role of each parameter separately, and even their compound action. Special functions (see the respective section in the Mac Tutor History of Mathematics at http://www-history.mcs.st-and.ac.uk) can be studied and represented in a suitable form, especially the so called "technical curves", those used in engineering, altogether with their associated curves, evolutes, involutes, inverse, pedal curves etc. Parametric and polar coordinate functions - besides using the built-in

commands - can be easily obtained as the trace of the point moving along the curve. This is maybe closer to the technical properties of these curves, than the classical way of representing them.

Special Curves revisited - the Evolute of the Cycloid
(poster)
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Interactive tables in the teaching
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The history of mathematics not only means how improved mathematic methods, but it means how improved utensils too. Interactive table is a new utensil and we can use it nowadays, not only in the business sector, but in the teaching too. In my talk I want to speak about this useful and modern digital "black-board". What are its advantages and disadvantages, what are the experiences about it, how can we use it at the university? Where can we apply it? We will give some recommendations. Why do the teachers like or dislike it? Which are the reasons and risks? Why do I think we can apply it in the teaching of probability?

History of mathematics in mathematics classroom. Practical mathematics from long ago - original sources in mathematics classroom
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The historical context in the teaching of mathematics usually includes two approaches: the anecdotal and the chronological. These can be brought together by the use of the original sources into the classroom. This talk will describe the project on the history of mathematics related to surveying, and how the original documents served as an axis around which different mathematical concepts could be investigated by students in a secondary school.

Using the longest run for the teaching of recursive formula, asymptotic theorem and simulation

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The recursive formulas, the asymptotic theorems and the simulation are present in the different type of fields of the math-teaching in the higher education. But the exact knowledge of these definitions leaves a lot to be desired. The studying of some illustrative problems - besides the learning of the exact notions - may help in the understanding them. With this work - discussing an interesting and understanding part of probability-theorem for students too - we would like to give a help for this. The coin tossing experiment is studied. The length of the longest head or whatever head or tail run can be studied by asymptotic theorems (Földes), by recursive formulae (Schilling) or by computer simulations (Binswanger). The aim of the paper is to compare numerically the asymptotic results, the recursive formulae, and the simulation results. We consider both fair and biased coins.

The "two-constants" theory and tensors of the microscopically-descriptive Navier-Stokes equations

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The two-constants theory introduced first by Laplace in 1805 is the currently accepted theory describing isotropic, linear elasticity. The original, microscopically-descriptive Navier-Stokes [MDNS] equations were derived in the course of the development of the two-constants theory. From the viewpoint of these equations, we trace their evolution and the notion of tensor following in historical order the various contributions of Navier, Cauchy, Poisson, Saint-Venant and Stokes and note the concordance between each. If time permitting, we would like to talk about the fact that also in the formulation of equilibrium equations, we get the confronting theories of two-constants" in capillary action between Laplace and Gauss. And as an epilogue of our talk, we would like to trace the practice in terminology of naming of the Navier-Stokes equations.

Mathematics for History's Sake:
A New Approach to Ptolemy's Geography

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Almost two thousand years ago, Claudius Ptolemy created a world map, identifying the names and coordinates of over 8,000 settlements and geographical features. Using the coordinates of those cities and landmarks that have already been identified, a series of best-fit transformations has been applied to several of Ptolemy's regional maps. The mathematical techniques involved in this process are all modern. However, these techniques must be tempered with history. To think of Ptolemy's data as similar to that collected from a modern random sampling of a population and to apply unbiased statistical methods to it would be erroneous. Ptolemy's data is biased, and the nature of that bias is going to be informed by the history of the data. From where did it come? When did Ptolemy receive it? How old is it? Was it the most up-to-date information? While such techniques as cluster analysis, Procrustes analysis, and multidimensional scaling are called for and can be used to transform Ptolemy's data with minimal errors, the results may be inappropriate. Goodness-of-fit must be sacrificed for historical accuracy. It is only when the history of the mapped region is understood that mathematics may be applied.

Language of the early Hungarian mathematics researches

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Mainly Latin was the official language of Hungarian Kingsdom. The languages of mathematics education were Latin, German and Hungarian. I will show example of different types of textbooks and research papers.

Problem Solving Strategies in Ancient Mathematics

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History has been increasingly used in teaching mathematics. One way of doing so is to "import" problems and anecdotes to the classroom from the history of mathematics. Another way is based on the assumed relationship between

historical and psychological development: the methods and the order of the evolution of mathematical knowledge has an effect on the methods and the order of mathematical subjects in the classroom. Using this second way we focus on ancient problem solving strategies and the possibilities of their applications by students and teachers in our time. For example, we consider solving problems by discussion, the application of "regula falsi", the geometrical representations of mathematical problems, and some ancient strategic games as well.

Important theorems of geometry in grammar school

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In my work I'm going to represent the study of the development of students' creativity using computer aided teaching, lessons in IT classroom. Teaching geometry in the "Bolyai Grammar School specialized for natural sciences" is not an easy task. Here is introduced a didactic tool, DGS "GeoGebra" to teach and learn analytical geometry across the important theorems from geometry (Menelaus', Ceva's, Ptolemy's and Euler's theorem by sinus and cosines theorem), which nevertheless requires the same effort to understand the matter, but it takes a different and more active way to familiarize students with the topics. Traditional methods, and use of bow and rulers are not omitted either, as they develop students' motor skills and the perception of the plane and space.

Galileo's Difesa

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The University of St Andrews library has a copy of Galileo's Difesa di Galileo Galilei ... contro alle calunnie & imposture di Baldessar Capra (1607). Only a dozen copies of the original publication remain and only three of these have Galileo's autograph - the St Andrews copy being one of these three. Not only does the Difesa show some of Galileo's thinking at the time about the structure of the universe, but it also gives great insight into Galileo's character. Another important feature is the feeling it gives for the way in which science was conducted at the beginning of the seventeenth century. This lecture describes why Galileo wrote the book, summarises its contents, and makes some comments about the St Andrews copy.

The SOLVER Package in Teaching Operational research

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The percentage of the students enrolled in science, mathematics and computing field in Romania decreases dramatically (*Eurostat 2008*). Nowadays the fact that youths are not interested in the study of mathematics has become a reality. We consider that it is a necessity to analyze this situation and to determine methods to reverse this phenomenon.

Starting from the following statement: "The world our children are going to live in is changing four times faster than our schools" (*Willard Dagget*); we believe that one of the main problems are the exhausted, classical teaching methods. As a result, a sustainable pedagogical change is needed; the teaching methods of Mathematics should be improved.

One solution might be teaching mathematics interactively. In this way we can promote mathematical conceptualization and competence, we can obtain positive effects and feed-backs from students regarding their motivations, learning skills and implications in different educational activities. Consequently the students can have the opportunity to experiment by analyzing the methods and algorithms, and to reach to a deeper level. This way of teaching might create the possibility of a longer and better student-teacher relationship which might encourage students to ask and answer more bravely and which might make them feel free for expressing ideas anytime. Moreover we can increase the students' confidence in their individual works, their conceptual understanding and their ability to apply their knowledge.

We present our experiences in teaching operational research by using Microsoft Excel Solver for the master students. The presented results are based on two years experiences, period in which we studied the following aspects: Can this experience promote deeper mathematical conceptualization and competence? ; For which students? ; Under what circumstances can be used?

Usefulness of History in Teaching Mathematics

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In general the concept of numbers is not especially interesting for pupils. It is known, that the children 6 years old have a concept of small natural numbers e.g. among 1 - 10. This shows a similarity with the concept of numbers existed in the ancient times. In this presentation we discuss the role of elementary operations (addition, multiplication, power, extraction) in the construction of numbers. This discussion combined with the history of ancient times is applicable in the teaching of Math.

On some population dynamics models in the An Logic modelling program

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We present one and two species population dynamics models, both discrete and agent based, by using the Russian AnyLogic modelling program. Several examples and some necessary mathematics, mostly in the form of system of differential equations, are also presented.

On the visualization of the limit process

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In the talk we will present some possibilities of the programme package GeoGebra for the visualization of limit process done by some of my students. The students were asked to determine some limits of functions by using programme package GeoGebra. Their work, as a contribution to active learning, will be presented and analyzed. It is interesting that the students, working on their tasks, pointed out quite a few good and bed effects of computer-aided learning process caused by using the programme package GeoGebra.

Juraj Páleş and the First Pedagogical Institute in Spişská Kapitula (poster)

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The Pedagogical Institute in Spiaşká Kapitula was the first institute in the territory of Slovakia, which prepared future teachers for primary schools. In our article we describe the contribution of the first director Juraj Páleş to mathematics education and to education of other subjects.

The surface area of the sphere - How can high school students learn from the best problem solvers?

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How to lead students to comprehend the thinking that went on during the historical development of formulas related to the surface area and volume of the sphere? The emphasis will be on engaging the audience in the study of works of Archimedes.

The Bulgarian Mathematician Nikola Obreskov- Life and Mathematical Achievements
(poster)

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Development of astronomy - From mathematics to astrophysics

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Mathematics was combined since Antiquity with astronomy. Eudoxos of Knidos (408-350 B.C.) developed a mathematical-geometrical model of 27 homocentric spheres with uniform motion in order to explain the spiral motions of the planets. This model was improved by Aristoteles (384-322B.C.) using 56 spheres. For getting better consistence with the observations, Klaudios Ptolemaios (100-170 A.D.) developed a geometrical-mathematical model on the basic of the icycletheory of Apollonius of Perge (240-170 B.C.) and the excentric motion model of Hipparch of Nikaia (190-120B.C.). Inspired by ancient sources like Philolaos and Aristarch of Samos, Nicolaus Copernicus (1473-1543) developed his heliocentric model of the universe. Johannes Kepler (1571-1630) improved

the new system by introducing elliptical orbits instead of circles and non-uniform motion. A physical basis for the motion of the planets was finally provided by Isaac Newton (1642-1726) in 1687 with his law of gravitation.

In the second half of the 19th century a new, revolutionary branch of astronomy began to be practised, the New Astronomy, in contrast to positional astronomy and celestial mechanics. In the context of "classical astronomy", only the direction of star light was studied. In the 1860s quantity and quality of radiation were studied for the first time. The main point of research had crossed over from classical astronomy to the modern astrophysics, a notion coined in 1865 by the Leipzig astronomer Karl Friedrich Zöllner (1834-1882).

Around 1860 astronomers began to investigate the properties of celestial bodies with physical and chemical methods: In 1859 Gustav Robert Kirchhoff (1824-1887) and Robert Wilhelm Bunsen (1811-1899) decomposed solar light into the colours of the rainbow with a prism and measured the dark lines in the spectrum. By comparing the Fraunhofer lines with laboratory spectra, they were able to determine that certain terrestrial elements are also present on the Sun. On the basis of his radiation law Kirchhoff could provide a physical explanation.

A better physical understanding of the spectra was possible with the introduction of Bohr's atomic model. Only by analyzing the light of distant cosmic objects with a prism or grating, we get information not only about the chemical composition, but also about the temperature and other physical features of stellar surfaces. The fields of solar physics and stellar astrophysics as well as spectral photometry and finally quantitative spectral analysis of stellar atmospheres were established respectively. In addition, by measuring the line shifts in the spectrum and using the Doppler principle one can determine the velocities of the celestial bodies. Einstein's General Theory of Relativity provided a deeper insight in the structure and development of the universe. Astrophysics has brought a fundamental understanding of the macroscopic world of the stars and galaxies; cosmology became the most important part of astrophysics.

The seventh Conference on History of Mathematics and Teaching of Mathematics will take place in 2012 in Budapest.

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