Interdisciplinary education of junior historians of mathematics

Supported by a grant from Norway

Dept. of Mathematics and Descriptive Geometry, VSB-Technical Univ. of Ostrava,
Dept. of Mathematics, Faculty of Education, Masaryk University in Brno,
Dept. of Mathematical Sciences, University of Agder, Kristiansand

6th Winter Workshop on History of Mathematics

Mathematics and society:

How mathematics contributes to the quality of life

When: 21 – 24 January 2016

Where: Hotel U Loubů, Tři Studně, http://www.halva.org/hotel/

WWW: http://historiematematiky.webnode.cz/

Conference fee: 600 CZK / 25 EUR payable during the workshop

This annual meeting series traditionally strives to support interdisciplinary debate and explore various approaches to history of mathematics. In our effort to show mathematics as an indispensable part of our culture, this time we are focusing on how mathematics can improve the daily life of people. Rather than simply juxtaposing two contradictory claims, namely that "mathematics is all around us" or that "*real* mathematics is almost wholly useless" (G.H. Hardy), we propose to explore how mathematics influences people's lives both directly and indirectly.

Mathematics is frequently said to have contributed to developments in technology, notably in fields like aerodynamics and computing. On another level, doing well in mathematics was, since the industrial revolution, thought to imply the possibility of getting a better job, earning one's bread in a less mundane way, for example as a civil engineer as opposed to a bricklayer. On yet another level, actuarial mathematics allowed people financial security even during times of bad luck. More recently, mathematics and statistics have permeated economics as well as a wide range of scientific fields from biology through medicine to psychology and sociology.

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Final programme

Thursday

20:00-21:00 Welcome (JK, HD, RN)
Jan Kotůlek, *Czechoslovak Journal of Actuarial Mathematics*

Friday

9:00-10:30 **Danny Beckers**, *How mathematics education improves quality of life*
10:30-11:00 coffee break
11:00-12:00 **Helena Durnová**, *Computing technology as a facilitator of thinking: computers in Czechoslovakia in the 1950s*
12:00-15:30 lunch, free time / walk / cross-country skiing
15:30-17:00 **Jakub Rákosník**, *Continuities and discontinuities in the Czechoslovak social insurance and social politics in the first half of 20th century*
17:00-17:30 coffee break
17:30-18:30 **Viktor Dubovský**, *Emil Schoenbaum's dissertation on theory of algebraic bodies*
Jan Kotůlek, *Emil Schoenbaum and Czech school of actuarial mathematics*
18:30-20:00 dinner
20:00-21:00 **Milan Pobořil**, *Forming secondary school students' attitude to mathematics*

Saturday

8:30-9:30 **Michal Plavec**, *Shopkeeper arithmetic. The Mathematics and Mathematicians in Royal Town Nymburk in the second half of 16th Century*
9:30-10:30 **Franka Miriam Brueckler** and **Vladimir Stilinović**, Teaching arithmetic in the Habsburg Empire at the end of the 18th century—A textbook example
10:30-11:00 coffee break
11:00-12:00 **Franka Miriam Brueckler** and **Vladimir Stilinović**, 18th century arithmetic in modern education
12:00-15:30 lunch, free time / walk / cross-country skiing
15:30-16:30 **Rolf Nossum**, *Persecution and Patronage: Oscar Buneman's years in Britain*
16:30-17:00 coffee break
17:00-18:00 **Pavel Ludvík**, *Hilbert's vexation and taming of Hamel's monster*
18:00-18:30 **Jan Zeman**, *On students at Göttingen university in the beginning of 20th century*
18:30-20:00 dinner
20:00-21:00 *Discussion on the paper* H. Bos, Mathematics and its social context: A Dialogue in the staff room with historical episodes, *For the learning of mathematics* **4** (1984) (3), p. 2–9.

Sunday

Departure

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Abstracts:

How mathematics education improves quality of life

Danny Beckers
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During the twentieth century, mathematicians in various capacities tried to improve the quality of life. Feeling the urge to put their knowledge to society's use, the fields of insurances, econometrics, aeronautics, computing, communication technology and hydrodynamics were enriched by, if not founded on, mathematical techniques. Was it the crisis of the 1920s that spurred initial involvement, after World War II there was an even more general feeling of need among intellectuals, to contribute to society. They felt themselves the guardians of western culture and rallied to the rebuilding of war-trodden Europe. Financially supported by the United States (in various capacities), UNESCO and national governments, politically stimulated with Cold War rhetoric, new research projects and groups sprouted, blossomed and published results. One of the subjects of interest was mathematics education.

Arguably, mathematics education is not one of the prime subjects that pops to mind, when one wants to discuss the way mathematics improves the quality of life. Mathematics education was not under the influence of university mathematicians, at least not in the United Kingdom, in the United States and on the (Western) European continent. In the classroom, mathematics was the realm of teachers and teacher educators. Mathematicians were involved from the side line, in the sense that they taught mathematics (among others) to future teachers, and in many countries academic mathematicians served as members of boards – of schools, teacher training institutions, (journals of) teachers' societies, didactical research programs – thereby lending their stature to the benefit of math education. Interfering with the actual content or didactics of teaching was not intended. Nevertheless, one of the ways that mathematicians intended to contribute to improving quality of life in the western world of the twentieth century, was by getting involved in mathematics education. They did so in various ways, and for various reasons. Starting with participating in curriculum discussions in the early twentieth century, ending up in didactical research and writing textbooks in the 1960s and 1970s.

In this talk I will focus on the mathematical, didactical and political motives behind this involvement in the United States, the United Kingdom, the Netherlands, and France. Although the rhetorics (and intention?) was the same in the various countries, the outcomes were different, suggesting that national political stances and the way education was organized was influential in the (lack of) success academic mathematicians had in shaping math education.

The research for this lecture is building on Christopher J. Phillips, The New Math. A political history, Chicago: University of Chicago Press (2015); Christopher J. Phillips, In accordance with a “More Majestic Order”: The New Math and the Nature of Mathematics at midcentury, in: Isis 105 (2014), 540-563, and on my ongoing research in the history of mathematics education in the Netherlands.

Supported by a grant from Norway

Teaching arithmetic in the Habsburg Empire at the end of the 18th century—A textbook example

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We shall present a description of F. Steindl's textbook *Institutiones Arithmeticae* (1778), the first official mathematics textbook in the Hungarian part of the Habsburg Empire after the reforms of the education system in the 1770s. The textbook, which remained quite popular for over 50 years, includes a detailed description of reckoning methods and their practical applications, illustrated exclusively by "problems in context". It also includes many instructions for the teacher, making it an early example of a mathematics textbook paying attention to pedagogy. The full account and the detailed analysis of this textbook was recently published [1]. The current presentation will emphasize some of the most typical examples of methods of explanation of mathematical notions as well as presented problems and approaches to their solutions.

[1] Brueckler, Franka Miriam; Stilinović, Vladimir. *Teaching arithmetic in the Habsburg Empire at the end of the 18th century — A textbook example*. Historia mathematica. 40 (2013) 309–323

18th century arithmetic in modern education

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Continuing on the previous presentation, discussing the content of the textbook *Institutiones Arithmeticae* (1778), we shall present the results of research conducted in Croatian universities on the proficiency of modern students in solving arithmetical problems as posed in the above textbook. The findings, quite unexpectedly, seem to indicate that mathematics, science, engineering and economics students nowadays have significant problems in understanding and solving simple arithmetical word problems. This is even more astonishing if one takes into account that these problems were originally intended for students in very elementary mathematics classes in the "grammar schools" and gymnasia of that time (in fact, for most of the students, it would have been their first encounter with mathematics). Also, from the modern perspective the problems could be classified as suitable for upper primary students, while all the tested persons were university level students. With this presentation we hope to induce a discussion about possible approaches and solutions to this educational problem.

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Computing technology as a facilitator of thinking: computers in Czechoslovakia in the 1950s

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In 1946, Antonín Svoboda returned to Czechoslovakia, after having spent part of WWII at MIT, doing research on analogue computers, with a dream to create computer industry in Czechoslovakia. At that point, not many people envisaged what computers could do; but clearly, their construction demanded well-educated engineers and was rather expensive. Svoboda thus faced ignorance as well as interest of the key actors in the story: the ministry, the military, and the academia. Being THE computer pioneer in Czechoslovakia, he felt the need to explain how the computer works and what changes it would bring to researchers and people in general. In my talk, I will present a mosaic of the various aspects of Svoboda's rhetoric, designed to support the construction of quality computers in Czechoslovakia.

Emil Schoenbaum and Czech school of actuarial mathematics

Jan Kotůlek
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Social insurance is considered to be one of the most important achievements leading indisputably to improvement of the quality of life. Introduction of the social insurance would be impossible without thorough computations, which gave considerable impetus to the field of so-called actuarial or insurance mathematics. For the computations, many data should be collected and statistically interpreted, e.g., new mortality tables had been set up in every country before the introduction of social insurance.

In the 1920s, Czechoslovakia was among the top countries with respect to the quality of the social insurance system. Professor Emil Schoenbaum (1882–1967) was responsible for the mathematical computations concerning the Czechoslovak system and his pupils gained important positions in the administration of social insurance. He himself served as one of the directors of General Institute of Pensions in Prague (GIP) and became one of the leading figures in the actuarial mathematics before WW2.

Being of Jewish descent, he was sent on a forced leave from the Charles University on March 1, 1939. After the Nazi occupation, he asked – on his own initiative – for superannuation from GIP. With the help of ILO officer Osvald Stein, Schoenbaum was able to emigrate from Europe. In 1942 he moved to ILO temporary seat in Montreal to become ILO Actuarial Adviser. In 1944, he joined Beneš exile administration and helped with a programme of Social Insurance Reform for post-war Czechoslovakia.

After the war, Schoenbaum returned to Prague and assumed his former professorship in December 1945. Nevertheless, his influence on the evolution of social insurance and introducing so-called national insurance, seems to be rather indirect or even limited. Being aware of the rise of the power of the Communist Party, he agreed to accept an offer of Mexican Government to become advisor for their preparation of social insurance reform. He hesitated to return, when he was accused of „abandoning the service and manifesting hostile attitude to people's democracy" in September 1950. In is a sad fact that he is probably more known in Mexico than in the Czech Republic today.

Persecution and Patronage: Oscar Buneman's years in Britain

Rolf Nossum
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The German student Oscar Bünemann, in trouble with the Nazi authorities in the mid-1930s, chose to emigrate to Britain and pursue a PhD there. After emigration, his surname appears as Buneman. On the verge of completing his degree in 1940, he was detained as an enemy alien and spent almost a year in internment. Upon release, he found work as an atomic scientist in England, and went on to lead a post-war career as a pioneering plasma physicist in the USA.

We study forced migration of European scientists before and during the Second World War, and scientific patronage in the host countries. Buneman's case is interesting from several points of view. Being a non-Jewish, non-communist, anti-Nazi activist, he belongs to a group not much investigated by historians. To be sure, his main interests were mathematics and its applications, not politics. His emigration from Germany was facilitated by his family's business contacts in Britain. Being caught up in the wave of detainments of enemy aliens in 1940, he was assisted in pleading for release by the Society for the Protection of Science and Learning, the archives of which abound with information about scientists who emigrated from Nazi Germany. We have also had access to material not available to previous investigators, kindly provided by Buneman's family.

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Shopkeeper arithmetic. The Mathematics and Mathematicians in Royal Town Nymburk in the second half of 16th Century.

Michal Plavec
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Royal Town of Nymburk had around 1580 approximately 2500 – 3000 inhabitants. People had an ordinary education, more than half of them could write and read. But we cannot expect any deeper mathematical knowledge apart from the so called shopkeeper arithmetic. The main problem was that measures and the process of measurement were not unified and there were big differences between units of measurement with the same name, town by town. In the case of Nymburk, there was typical Nymburk lane (*nymburský lán*) which is thoroughly explained in book of town property from 1542. The next trouble was question of money. Basically, there were used Prague and/or Meissen Groschens (pražský nebo míšeňský groš) which were usually divided as follows: 1 Grosch = 7 coins (peníz) and 60 Groschen = 1 kopa (60 units). This made difficulties as well. Our predecessors used simple tables which allowed them to make year´s economical overview, for example, very easily. The procedure was called "putting on the table" (kladení na desky, kladení počtů). But as far as we know there was not any deeper knowledge of mathematics, probably with an exception of noble family Šúd ze Semanína, whose members were settled in town and some of them were involved in astrology.

Looking forward to seeing you

Jan Kotůlek, VSB-TU Ostrava
Helena Durnová, MU Brno
Rolf Nossum, UiA Kristiansand

The meeting takes place under auspices of