THE GYULA FARKAS MEMORIAL COMPETITION IN THE CONTEXT OF THE HUNGARIAN SCIENTIFIC COMPETITIONS

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ABSTRACT

Gyula Farkas (1847-1931) became a well-known scientist in his age due to his thermodynamic achievements, but today – after rediscovering his articles in 1950 – he is also noted as one of the founders of operation research. On the occasion of the 150th anniversary of his birth, his name became known beyond scientific circles.

In this article, brief introduction into his life is given. The emphasis is put onto his achievements which provides modern context for efficient introduction of younger generations into the scientific world, and especially scientific methodology and interdisciplinary approaches.

KEY WORDS

Gyula Farkas, sciences, thermodynamics, scientific competitions

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INTRODUCTION

Gyula Farkas was born on 28th March 1847 in Pusztasárosd (now Sárosd) near Lake Balaton, where his father was an estate supervisor on an Esterházy property there. During his secondary school years in Győr he got acquainted with Ányos Jedlik, one of inventors of dynamo and it was Jedlik's encouragement which directed him towards physics. Farkas was interested in music at a young age. He was devoted to music later in his life, too: he wrote several articles in music, played the piano and gave performances also outside Hungary.

In 1874, still as a secondary school teacher, he had the opportunity to read one of his papers at the Hungarian Academy of Sciences, which was given a criticism by Loránd Eötvös. The following years in Gyula Farkas's life were marked by Eötvös's demands: he could obtain widespread scientific knowledge ability and was able to deepen his mathematical awareness.

Farkas got a job as tutor of the Batthyány counts, who played an important role in the beginnings of his scientific career. They built a laboratory of physics in one of their castles, and Farkas, escorting his aristocratic students, had the opportunity to make some professional acquaintances.

Although his first remarkable works were in the fields of algebra published, from 1880 he became the privat-docent of function at the University of Budapest. In 1887 he was appointed the professor of the mathematics and physics department at the University of Kolozsvár (now Cluj-Napoca, Romania). His state is special because at the beginning of his scientific career he was noted more as a mathematician, later more as a theoretical physicist, yet his scientific oeuvre looks homogeneous became the most important feature of his articles in physics had a strict mathematical background.

In 1893 Gyula Farkas was delegated by University of Kolozsvár at the Galilei celebrations in Padoa, where he was appointed honorary professor. Focal articles of his oeuvre were connected to this event, as his article titled *A virtuális sebességek elve Galileinél* (eng. *The theory of virtual speed at Galilei*) was written after this celebration. After this the main area of his research became this branch of mechanics.

Between 1893 and 1926 Farkas wrote nine articles about virtual speed and the mathematical problems relating to it, whose effect on the theory of optimalization was first valued by András Prékopa [1]. The Farkas Theorem was first determined in [2] and was first used to describe the mechanical balance. His achievements in mathematics became known by his article [3], and the rediscovery of this article made him the often cited classic of the theory of optimalization.

Another important publication of his preceded the thermodynamic theory of Caratheodory. Latest research has found that the foundations of thermodynamics by Farkas were described fourteen years earlier than those of Caratheodory and they were completely different from those, but followed a much simpler way [4].

Gyula Farkas was appointed a member of the Hungarian Academy of Science in 1898. He was the Dean of the University of Kolozsvár seven times and in the academy year of 1907/1908 he was the Rector of it. He played an important role in the development of the traditions of mathematics in Kolozsvár, namely that Frigyes Riesz, Alfréd Haar and Lipót Fejér taught at the university.

The results of modern physics also appeared in his university talks, he was the first in Hungary who gave lectures about the special theory of relativity[1] [5]. Gyula Farkas resigned because of his eye problems and lived in Budapest from 1915 until his death in 1930.

The basic principle of homogenous linear inequalities, published in the Crelle Journal, became part of the history of mathematics as the Farkas Theorem. Albert W. Tucker rediscovered it in the 1950s and used it in his proofs[2] [6]. Later Farkas was recognized as the predecessor of several areas of modern science (e.g.: linear programming, economic and mathematical optimalization). One of the latest synthesis of mathematical history thinks that the Farkas Theorem is one the most important thesis in the historical precedent of linear programming [7].

THE BEGINNINGS AND THE CHARACTERISTICS OF THE GYULA FARKAS MEMORIAL COMPETITIONS

THE EVENTS OF THE FARKAS-ANNIVERSARY

Commemorating the 150th anniversary of the Birth of Farkas the periodical *Fizikai Szemle* published six, and the *Természet Világa* two articles about Gyula Farkas' life and work. The book titled *Új utak a magyar operációkutatásban* (eng. *Alternative Ways in Hungarian Operation Research*) contains two lectures given at the Institute of Mathematics. A sixty page book was published (titled *Farkas Gyula élete és munkássága* (eng. *Gyula Farkas' life and work*)) in 2003 [8]. The most important event of the fortunately growing Farkas cult was the international scientific conference held in Kolozsvár (Cluj-Napoca) in Aug 2004.

The beginning of the Gyula Farkas Memorial Competition in Sárosd is also connected to the anniversary of his birth. Farkas's name thanks to a local historical was already known is Sárosd. The private initiative to erect a memorial plate and a similar intention by the Loránd Eötvös Physical Society and the Bolyai Society made the decision by the local authorities faster. Farkas's birthplace was marked by the memorial plate in 1997.

The next step in building the Farkas cult was that the local primary school took up Gyula Farkas' name. On this occasion László Filep, the author of the first biography presented the school with the photos which he received from the relatives of Gyula Farkas. They have been commemorating the locally born scientist with a memorial competition since 2000.

THE SCIENTIFIC FEATURES OF THE COMPETITION

The Gyula Farkas Memorial Competition, which commemorates the intricate work of the eponym, is a complex science competition, which contains musical, art and drama tasks, too.

The participants of the competitions

There are 10-12 teams at the competition in two age groups pupils in the 5th–6th grade and pupils in the 7th-8th grade make up four member teams. Apart from the Sárosd region two forcing Hungarian schools take parts. The relationship with the Báthory Lycée was justified by the fact that Gyula Farkas was a professor in Kolozsvár, the teams from Zenta (Senta, Serbian Republic) applied for the invitation. This way it is possible for the Hungarians to keep contact with Hungarian minorities living in bordering countries in an informal way, too. At the same time both the students and the teachers can have a closer look at the characteristics of the teaching methods in the different countries (it is a striking fact that the team from Kolozsvár has a precise apparatus in solving a mathematical problem, whereas the Hungarian teams are more flexible in the reacting to situations outside the curriculum).

Diversity of the exercises

The students in the 5th–6th grade and in the7th–8th grade get two tasksheets relevant to their knowledge. These tasksheets do not demand the reproduction of the knowledge typical in

primary school testpapers, but the creative use of mathematical terms outside curriculum. At the beginning of the competition each group has to fill in a 13 + 1 quiz question sheet about Gyula Farkas's life. The playfulness of the competition and the mobilisation of the multiform creativity is encouraged by the performance of a short play. The teams make and exhibit drawings, watercolours and collage an a pre given topic beforehand and these can be seen before and during the competition. The 10–15 minute, which is based on a preset theme, is directed by the students and preformed between the two rounds of the competition. Pongrác Kacsóh, who took his doctorate at Gyula Farkas, composed music for Petőfi's *János vitéz* epic poem. The jury also evaluates these performances.

Direct connection between the universal-scientific sphere and the primary school

The teachers at the primary school and the university lecturers make the preparations for the competition together. Thus the lecturers can follow the basic scientific terms of knowledge of students and can perceive the one sidedness of primary school coursebooks (being stuck to patterns or distortion of certain terms e.g.: in case of the concepts of work or energy). The primary school students can get a notion of a different point of view in an informal way and they can experience that the terms used in scientific thinking can be reflected and cab be thought over. The presence of the university lecturers and researchers as private people and voluntary the helps entails the productive operation of the network of personal relationships several institutions (Eötvös Loránd University, Budapest University of Technology and Economics, College of Nyíregyháza) and disciplines (mathematics, physics, history of science and philosophy) take part in the organisation of the competition, and organizers and members of juries of other competitions take part or took part in this process. Thus students can get a wider scale of information, which can help then in career orientation. (The direct helping touch with the universities can be seen only in few examples now, but hopefully it will contribute to the general growth in the number of future graduates.)

The growth of the operation area of the organizing school

The Gyula Farkas Primary School in Sárosd joined directly into the fostering of the Farkas traditions became determining in the school's image. The new name of the institution, the memorial plate dedicated to the eponym strengthens the cohesion of the institutions, at the same time the board of teachers and the lenders of the school are present at scientific events related to eponym. Their delegation took part at the conference at the Babes-Bolyai University and they donated a painting of Gyula Farkas for the university, which is placed in the hall named after him. The costs of the publishing of the book *Farkas Gyula élete és munkássága* (eng. *Gyula Farkas' life and work*) [9] were mostly covered by the financial benefit from the county authorities for the primary school in Sárosd.

THE PLACE OF THE GYULA FARKAS MEMORIAL COMPETITION AMONG THE HUNGARIAN SCIENTIFIC COMPETITIONS

In Hungary the secondary school competitions have a longer history and among these tue the mathematics competitions have a traditionally important role. The *KÖMÁL* (shorthand for *Secondary School Mathematics Journal*) has been carrying out a mission in taking care of talented students since 1912, and many of the prize-winners (who have been recorded since 1926) have later become internationally noted like the mathematician Pál Erdős and the Wolf-prize winner László Lovász but also the philosopher of science Imre Lakatos, the Nobel-prize winner economist János Harsányi.

The most important focus point of these competitions is problemsolving, which has traditionally been emphasized in Hungarian education of mathematics, too. This concept gives the background to György Pólya's book titled *How to solve it?*, which is the best known interpretation of his heuristical method. The Hungarian mathematical reforms in the 1950s made a similar view significant. Tamás Varga, who developed the theoretical basis of the reform in the education of mathematics, together with László Kalmár and Rózsa Péter represented the empirical mathematical view, and originally all tree of them (together with Imre Lakatos) were Sándor Karácsonyi's students at the University of Debrecen [10]. Certain elements of the empirical view can also be found in the works of Árpád Szabó, who is the most characteristic representative of the Hungarian research of history of mathematics [11].

This tradition in education and competitions put a significant effort on Hungarian mathematical and science competitions, too (such as the National Secondary School Competition or the Pál Bugát Natural Competition). New phenomena in the 1990s are those primary school competitions in mathematics, which became nationwide events organized by one single school, for example Ilona Zrínyi Competition in Kecskemét and the Bátaszék Competition in Mathematics.

A common feature of the above listed competitions is that they work within the existing educational structure (which is true for the structure of competitions in higher education, too). The competition in Sárosd is not a nationwide one, it is a regional competition, but it is irregular in several ways. There are also university lecturers in the organisation and jury in the above mentioned secondary school and primary school competitions, but compared to these, the number of lecturers from universities is a lot higher at the Gyula Farkas Memorial Competitions.

The place of the Gyula Farkas Memorial Competition is not defined by the number of participants or its importance in the structure of competitions in Hungary, but by its focused character, which comes from the cooperation of the local authorities, the public educational authorities and the higher educational spheres. Its true importance is in its value being an example it gives a model for recognizing and keeping the local traditions and how these can be connected to the propagation of relevant knowledge informally and taking care of the talented students in a way which encourages competitive skills.

REMARKS

[1]László Filep found the then living relatives of Farkas in the 1970s, according to whose memories Gyula Farkas was corresponding with Einstein.

[2]András Prékopa writes about the rediscovery of the articles this way: Albert W. Tucker was working on one of the proofs of the nonlinear programming with his Ph.D. student Harold W. Kuhn. They got stuck and they aleded the results in connection with the linear inequalities. Tucker sent his student down to the library to search and Kuhn found Gyula Farkas's article then, which contained exactly what they need.

REFERENCES

[1] Prékopa, A.: *On the development of optimization theory*.
     American Mathematical Monthly **87**, 527–542, 1980,
[2] Farkas, G.: *The Use of the Fourier-Theory in the Mechanics*. In Hungarian.
     Matematikai és Természettudományi Értesítő **12**, 457–472, 1894,
[3] Farkas, J.: *Theory of Simple Inequalities*. In German.
     Journal für Mathematik **124**(1), 1–27, 1902,

[4] Martinas, K. and Brodszky, I.: *Thermodynamics of Gyula Farkas – a new (old) approach to entropy*.
Periodica Polytechnica **44**, 17–27, 2000,

[5] Filep, L.: *Gyula Farkas' life and work*. Ph.D. Thesis.
Debrecen, 1977,

[6] Prékopa, A.: *Gyula Farkas' life and the importance of his work in the theory of optimalization*. In Hungarian.
In Komlósi, S. and Szántai, T., eds.: Alternative Ways in Hungarian Operation Research. Dialóg Campus, Budapest–Pécs, 15–31, 1999,

[7] Brentjes, S.: *Linear optimalisation*.
In Grattan-Guinness, I., ed.: Companion Encyclopediae of the Mathemathical Sciences II. London, 828–833, 1994,

[8] Komlósi, S. and Szántai, T., eds.: *Alternative Ways in Hungarian Operation Research*. In Hungarian.
Dialóg Campus, Budapest–Pécs, 15–31, 1999,

[9] Martinás, K., ed.: *Gyula Farkas' life and work.* In Hungarian.
Eötvös Loránd Fizikai Társulat Termodinamikai Szakcsoportja, Budapest, 2003,

[10] Gurka, D.: *A Missing Link: The Influence of László Kalmár's Empirical view on Lakatos's Philosophy of Mathematics*.
Perspectives on Science **14**(3), 263–281, 2006,

[11] Máté, A.: Árpád Szabó and Imre Lakatos, or the Relation Between History and Philosophy of Mathematics.
Perspectives on Science **14**(3), 282–301, 2006.

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SAŽETAK

Gyula Farkas (1847-1931) postao je poznati znanstvenik svog vremena zbog dostignuća u termodinamici. U današnje vrijeme – nakon ponovnog otkrivanja njegovih članaka tijekom 1950-ih godina – smatra ga se začetnikom operacijskih istraživanja. Prigodom 150. obljetnice njegovog rođenja njegovo ime postalo je poznato izvan znanstvenih krugova.

U ovom radu ukratko je opisan njegov životni put. Težište je stavljeno na psotignućža koja su omogućila suvremeni okvir za učinkovito uvođenje mlađih generacija u svijet znanosti, a posebno znanstvene metodologije i interdisciplinarnih pristupa.

KLJUČNE RIJEČI

Gyula Farkas, prirodne znanosti, termodinamika, natjecanja iz znanosti