Jarník's Notes of the Lecture Course Allgemeine Idealtheorie by B. L. van der Waerden (Göttingen 1927/1928)

Jarník's Notebooks from Göttingen

In: Jindřich Bečvář (author); Martina Bečvářová (author): Jarník's Notes of the Lecture Course Allgemeine Idealtheorie by B. L. van der Waerden (Göttingen 1927/1928). (English). Praha: Matfyzpress, 2020. pp. 57–60.

Persistent URL: http://dml.cz/dmlcz/404380

JARNÍK'S NOTEBOOKS FROM GÖTTINGEN

From the 1870s onwards, the most talented and outstanding mathematicians and physicists from the Czech lands went abroad, enabled by government scholarships and funding, in order to extend and deepen their mathematical knowledge and skills. Among these were Ludvík Kraus, František Machovec, Jan Vilém Pexider, Antonín Sucharda, Josef Sylvester Vaněček, Eduard Weyr, Emil Weyr, August Leo Otto Biermann, Karl Bobek, Seligman Kantor, František Nachtikal, August Seydler, Vincenc Strouhal. Others went to complete their doctoral degrees or to publish their books or papers. They travelled mainly to Germany, France or Italy and studied in the most prestigious mathematical centers of the period, at Berlin, Göttingen, Hamburg, Leipzig, Munich, Paris, Strasbourg, Milano, and Rome. Here, they hoped to be more closely involved in the latest mathematical trends and methods and to become acquainted with the newest ideas in the field; they also hoped to be able to have their first papers accepted by respected journals and their first monographs issued by internationally known publishing houses; and finally, they sought out the most advanced education methods which they could bring back with them on their return to universities and polytechnics in the Czech lands.

These trends continued through the first three decades of the 20th century, when Czech and German mathematicians from the Czech lands obtained scholarships to study in Göttingen (Josef Grünwald, Vojtěch Jarník, Jan Vilém Pexider, Ladislav Seifert, Emil Schoenbaum, Václav Simandl, František Vyčichlo), in Hamburg (Otakar Borůvka, Vladimír Kořínek), in Munich (Ludwig Berwald) and in France or Italy (Otakar Borůvka, Eduard Čech, Václav Hlavatý, Václav Pleskot, Václav Posejpal, František Rádl, Ladislav Seifert, František Vyčichlo).

Basic characterization

Among the most valuable archival materials from this period deposited in the Archive of the Academy of Sciences of the Czech Republic are fourteen "notebooks" which contain the lectures of Emmy Amalie Noether, Karl Grandjot, Pavel Sergeevich Aleksandrov and Bartel Leendert van der Waerden. These notebooks were kept by Vojtěch Jarník, the future prominent mathematician, during his studies at Göttingen in the academic years 1923/1924, 1924/1925 and 1927/1928.

The notebooks were discovered by Jindřich Bečvář in 2004 when he was preparing an extensive monograph on the life and work of Vladimír Kořínek

(1899–1981), an outstanding Czech algebraist of the 20th century.[1] Kořínek's unusually vast archival collection containing his personal, pedagogical and professional materials as well as some materials of his friends and colleagues from Charles University and the Czech Academy of Sciences is of special interest as it allows us to trace the development of mathematics in our country.[2]

Although Jarník and Kořínek were good friends and colleagues, we are not able to explain how Jarník's notebooks came to be deposited in Kořínek's archival collection. As we described in the chapter devoted to Jarník's life, we know that he studied modern structural algebra under Noether in the academic year 1923/1924 and 1924/1925: the notebooks contain her lectures titled *Invariantentheorie* (summer semester 1923/1924), *Körpertheorie* (summer semester 1923/1924), *Gruppentheorie II* (winter semester 1924/1925), *Hyperkomplexe Zahlen und Gruppencharaktere* (winter semester 1927/1928); the theory of numbers and modern structural algebra under van der Waerden in the academic year 1927/1928: the notebooks contain his lectures titled *Allgemeine Idealtheorie* (winter semester 1927/1928) and *Algebraische Zahlen* (summer semester 1927/1928); modern algebra under Grandjot in the winter semester in 1927/1928: the notebooks contain two of his lectures titled *Algebra II* and *Galoissche Theorie*; and analysis under Aleksandrov in the summer semester 1927/1928: the notebook contains his lecture titled *Punktmengen und reelle Funktionen*. It is not without interest that Jarník attended lectures predominantly on modern algebra and very rarely those on number theory and analysis, although these two topics represent his main mathematical subjects.

Jarník's notes were kept in small rectangular exercise books (16,4 × 20,6 cm) each with a hard black cover; they have been preserved in an amazingly good condition. His German notes are carefully written in blue ink; almost everything is legible. They have few grammatical and syntactic mistakes, almost no corrections and contain very few inaccuracies.[3] Each notebook has 120 pages, usually completely filled with notes. On the interior page of the cover, Jarník's Göttingen address is written (in the academic year 1927/1928 – Dr. V. Jarník, Göttingen, Bühlstrasse 28).

Jarník's notebooks give us a record of Göttingen's mathematical lectures and seminars, which were very popular in the Czech lands before the Second World War. They also provide information on mathematics and teaching in Göttingen, information not generally known even in Germany. Most importantly, they were written by an excellent Czech mathematician who possessed an acute understanding of the material being presented. Since we do not have many similar documents from that time, they are a unique contribution to

[1] Z. Kohoutová, J. Bečvář: *Vladimír Kořínek* (*1899–1981*) (in Czech), Edition History of Mathematics, volume 27, Research Center for the History of Sciences and Humanities, Prague, 2005.

[2] In the Archive of the Academy of Sciences of the Czech Republic, there are 46 archival boxes of Kořínek's documents.

[3] Only the records of Noether's lectures are not quite so clear, but as we know from the recollections of her students, she was not a good lecturer.

our understanding of this period, and should be interesting not only for mathematicians, but also for historians, linguists and everyone who wants to learn something about mathematics in the first half of the 20th century.[4]

Van der Waerden and his Allgemeine Idealtheorie

After publishing the Aleksandrov's lecture course titled *Punktmengen und reelle Funktionen*[5] we decided to continue with a study of Jarník's sixth and seventh notebooks.

The following section therefore contains the lecture course of van der Waerden titled *Allgemeine Idealtheorie*[6] taken from his two notebooks plus our commentary.

In the first half of the sixth notebook Jarník wrote down the dates of the lectures,[7] in the second half of the sixth notebook and in the seventh notebook he did not write the dates of the lectures, as he usually did in other notebooks. From his inscription we know that he attended van der Waerden's lectures titled *Allgemeine Idealtheorie* in Göttingen in the winter semester 1927/1928. We think that the period in which the course was delivered was from the beginning of the November 1927 up to the end of the January 1928. The one-hour lectures were performed twice time by week.[8]

Jarník's notes can be naturally divided into five parts: *Kapitel I* (64 pages, 8 paragraphs), *Kapitel II – Körpertheorie* (46 pages, 9 paragraphs), *Kapitel III – Idealtheorie in Polynombereichen* (18 pages, 4 paragraphs), *Kapitel IV – Allgemeine Idealtheorie* (23 pages, 7 paragraphs) and *Kapitel V – Ganze algebraische Grössen* (19 pages, 3 paragraphs).

The contents of the notebooks carefully follows that recorded by Jarník. No corrections according with contemporary German orthography have been made. Only some missing full stops at the end of the sentences and some evidently missing letters (for example "n" in the word Mannigfaltigkeit) were added. Some paragraph breaks were introduced to allow a clearer understanding as

---

[4] The first part of the chapter is adapted from the chapter in M. Bečvářová, I. Netuka: *Jarník's notes of the lecture course Punktmengen und reelle Funktionen by P.S. Aleksandrov* (*Göttingen 1928*), Edition History of Mathematics, volume 43, Matfyzpress, Prague, 2010, 143 pages. It is taken with the permission of the coauthor.

[5] See M. Bečvářová, I. Netuka: *Jarník's notes of the lecture course Punktmengen und reelle Funktionen by P.S. Aleksandrov* (*Göttingen 1928*), Edition History of Mathematics, volume 43, Matfyzpress, Prague, 2010, 143 pages.

[6] The sixth notebook contains 116 pages of van der Waerden's lectures, the last 4 pages are blank. The first 54 pages of the seventh notebook contain van der Waerden's lectures, then the table with the "classification of rings" was added to the notebook (it was not written by Jarník), 2 following pages are blank and then the next 60 pages of the notebook contain a part of van der Waerden's lecture titled *Algebraische Zahlen* which continues in Jarník's fifth, eighth and ninth notebooks, and the remaining 2 pages are blank.

[7] The November 4, 1927 is the first recorded date (written on the first page), the December 12, 1927 is the last one (written on the page 93).

[8] On the page 23 in the "University calendar" for the winter semester 1927/1928, there is written: *Allgemeine Idealtheorie, Mo., Fr. 6–7. Dr. van der Waerden.*

Jarník usually wrote from margin to margin and the division of his text is not easy to follow. Jarník's symbol for the proposition – the simple twiddle on the left margin – was replaced in the computer transcription by two vertical segments on the left margin.