

The Contribution of Czech Soil Science at the Turn of the 19th and 20th Centuries to Knowledge of Soils: in Memory of Professor JOSEF KOPECKÝ

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At the turn of the 19th and 20th centuries Czech soil science was of considerable significance, even at an international level, and in published works, we come across a number of well-known personalities. Besides Prof. J. KOPECKÝ, these include for example Dr. J. SPIRHANZL and Prof. V. NOVÁK. Particularly in the early 20th century, the science school of Prof. JOSEF KOPECKÝ was well-known among the pedologic community for its innovative approach, and his name has often been quoted in professional literature to this day. This year, on the occasion of the 150th anniversary of his birth and the 80th year since his death, we commemorate this significant person and reflect on his contribution to soil science.

JOSEF KOPECKÝ was born on September 20th, 1865 into a farming family in the Czech district of Desná u Litomyšle. In those days it was part of the Austrian Empire, since 1867 referred to as Austria-Hungary. At secondary school young JOSEF already attained very good results

and, as he had a talent for agriculture, he gained financial support for study at the Hochschule für Bodenkultur in Vienna thanks to Litomyšl town authorities. He began the study of forestry but changed departments after a year. In 1890 he graduated in the specialisation of Kulturtechnik, a field of study very close to soil, melioration and water in the landscape, which today would be referred to as landscape engineering.

His studies guided him towards soil science, which he took up in the technical office of the Agricultural Council for the Kingdom of Bohemia, where he headed the soil study department and soil science laboratory since 1894. At that time the main function of the technical office was primarily to carry out soil research during regulation and melioration projects. Physical properties of soil, issues relating to water and air in soil and infiltration were very important in these projects. Within ten years of his graduation he had perfected Schöne's instrument for determining soil grain via the floating-off method (three-cylinder elutriator), which allowed analysis to be carried out more quickly, and thus more frequently. At the beginning of the 20th century, assisted by only one technician, KOPECKÝ was carrying out approximately 1500 soil analyses per year. In these analyses he worked with particles smaller than 0.01 mm as the determination of smaller clay particles was more difficult and very time-consuming, and for the purposes of the carried out research, KOPECKÝ's solution was quite adequate. This approach was used successfully in Central Europe with slight modification up to the 1960s. By the late 19th century these particles were used to determine water flow in land drainage. KOPECKÝ's methods and tables for drainage proposal were commended in 1907 at the 8th International Agricultural Congress in Vienna and became the foundation for all later proposal methods based on soil grain.

KOPECKÝ also applied the sedimentation method to the issue of soil grain, if we remember the Prague modification of the settling cylinder and KOPECKÝ's volumetric modification of mechanical settling analysis. His further contributions to the field of soil physics include his methods and aids for determining

physical soil characteristics, especially porosity, water and air capacity, permeability and infiltration, and his development of a soil classification scale in which he took into consideration particles smaller than 0.01 mm and fractions in the range of 0.01–0.05 mm. KOPECKÝ's best-known innovation was the stainless steel Kopecký cylinder, which is used throughout the world.

KOPECKÝ used the 70 cm³ cylinder to determine volumetric mass/bulk density and in subsequent calculation of porosity. Using the cylinder he studied water capacity. In making proposals for drainage systems, knowledge of infiltration was important. KOPECKÝ also used the cylinder in determining the permeability of soil and in measuring the amount of water that would pass through the soil in the cylinder in 24 hours. KOPECKÝ did not deal with simply physical issues of soil. At that time the decision had been made to begin mapping soils and Prof. KOPECKÝ worked on the problem of soil evaluation. As this was a new issue, work was begun in one district near the Central Bohemian town of Velvary. This included the publication of an agronomic pedological map in 1908, and KOPECKÝ introduced the idea of carrying out pedological cartography of the Kingdom of Bohemia. This was eventually realised on a widespread scale half a century later, when work on a Complex Soil Survey was initiated in Czechoslovakia in 1961. In the 1920s KOPECKÝ worked with Dr. SPIRHANZL on a map of soil textural classes in Czechoslovakia, which was published in 1931.

As a result of his innovative approach and diligence, KOPECKÝ was nominated as adjunct professor (1908) and full professor in 1911. His scientific and pedagogical work was in association with the Agricultural Faculty of the Czech Technical University in Prague, and, after the establishment of independent Czechoslovakia in 1918, at the Faculty of Agriculture and Forestry through the Czech Technical University in Prague (an independent University of Agriculture and Forestry was established in Prague after WWII, which KOPECKÝ did not live to see). He was the Dean of the Faculty four times, each time for one year. His activities led, in the 1920s, to close integration of soil science and agro-meteorological research, as is apparent, besides numerous publications, in the establishment of the State Agro-Pedological and Bioclimatic Research Institute, of which he was the Head from 1919 until 1934. In 1931 a department of pedo-microbiology was established within the institute.

KOPECKÝ's work also had considerable international significance, as is evident in the use of his method abroad, cooperation on an International Soil Map of Europe in the 1920–1930s, and organisation of the international conference in Prague in 1922. Previous conferences, held in Budapest and Stockholm in 1909 and 1910, were entitled Conference of Agrogeology. At the Prague conference the expression “pedology” appears in the title – Conference of Agropedology. A subsequent conference, held in Rome in 1924, saw the establishment of the International Society of Soil Science – ISSS (International Union of Soil Sciences at present). KOPECKÝ was involved in preparing the foundation of what, for soil scientists, became a significant specialist and scientific society. From an international perspective, KOPECKÝ's contribution to soil science in those days was evident and recognised in his honorary membership of ISSS, which was granted to him in 1924, along with other significant personalities within soil science such as Professors L. CAYEUX, K.D. GLINKA, E. RAMANN, Sir J. RUSSELL, and S.N. WINOGRADSKYI. The reputation of Czech soil science and Prof. KOPECKÝ's renown is evident in an invitation to the World Congress of Soil Science, Washington 1927, received by Ing. JANOTA, Councillor, head of the building office and pedologist of the Agricultural Council of the Kingdom of Bohemia. Among other things the invitation stated that, in scientific soil research for the benefit of technical culture, Czechoslovakia is at the forefront and that Prof. KOPECKÝ created a school that serves as an example to others, and therefore the Czechoslovakian representatives to the conference can provide other countries with the benefit of their knowledge.

The fruitful life of Prof. JOSEF KOPECKÝ came to an end on December 8th, 1935 when he suffered a sudden stroke. From all expert and historical sources it is evident that the name of this eminent scientist is indelibly written into the world of soil science, and has still been quoted in publications to this day.

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