

G.J. Mendel's meteorological observations

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Abstract

G. J. Mendel is an important figure in the history of Czech meteorology. He was responsible for the expansion of the weather observation network in Moravia. His measurements are part of the Brno series, one of the longest in the region of the Czech Republic. On the list of his publications, ones about meteorology prevail, which are not just the result of analysis of his measurements, but also works that give detailed description of the physical basis of meteorological phenomena and come with some new findings. Looking at Mendel's list of scientific works as a whole, one can see that he was a scientist with exceptionally broad specialization, who was able to analyze individual phenomenon as well as be aware of the natural processes on a global level. At this point it is also necessary to point out his great observational talent, accuracy, diligence and precision, all of which he proved in his meteorological activities.

Key words: G. J. Mendel, meteorological observations, agriculture, Brno

Introduction

Gregor Johann Mendel left a significant mark in history of science as a brilliant geneticist and so it comes as a surprise to many that while being the abbot at the Augustinian monastery during the period of his major discoveries, he saw himself as a meteorologist (Figure 1).

This fact is supported by records from his meteorological observations, which he not only hand written himself, but also analyzed. It is proved that on a petition of the Natural Science Society from 1870 regarding foundation of Moravian university, Mendel has meteorologist as his profession. It is of course obvious that the significance of Mendel's observations of the weather in Brno is far from the

significance of his genetic laws. It is, however, absolutely reasonable to say that during his life he devoted at least as much time to meteorology as he did to his other scientific activities. This is also seen from the list of his publications, where ones concerning meteorology prevail by far (Appendix A). Unlike the significance of his genetic discoveries, which was only realized after his death, his meteorological works were well-known and his opinion sought and valued.

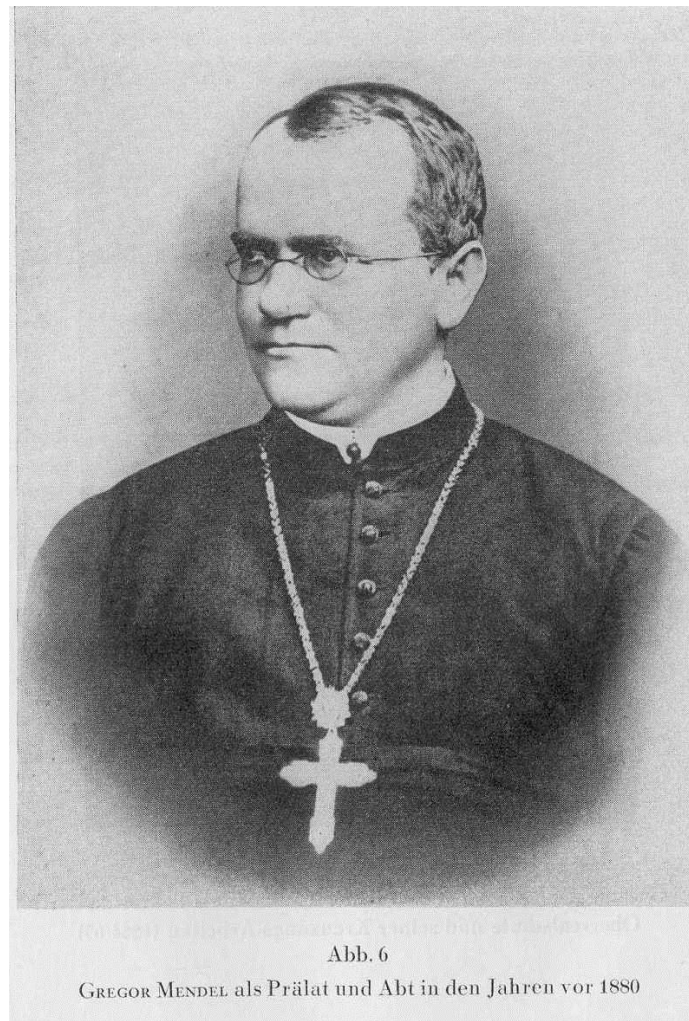


Figure 1 – Gregor Johann Mendel, a portrait from 1880 (Kříženecký, 1965)

Mendel's meteorological measurements in Brno

Based on evidences, continuous meteorological measurements were started by Dr. Paul Olexík on 1st January 1848 in the area of faculty hospital and finished on 30th June 1878 due to his severe illness. G. Mendel was Dr. Olexík's close friend and helped him with measurements at his station. An evidence for this is also Mendel's

description of Olexík's station. Based on Mendel's records, measurements were performed at the second floor of the house No.100 on Pekařská street, where a barometer (a device for measuring pressure) and a psychrometer (a device composed of two thermometers, one of which had a sock on its mercury flask, which on the other end was submerged in distilled water. The thermometer without this sock, the so-called dry-bulb thermometer, was used to measure the air temperature. The one with the sock, called the wet-bulb thermometer, measured temperature influenced by water evaporation, the so-called wet-bulb temperature. Both temperatures were then plugged into a psychrometric equation to calculate air humidity, in particular to calculate the water vapor pressure). Using these devices, pressure, temperature and humidity values were obtained. Dr. Olexík's minimal thermometer and rain gauge was placed in the garden of the hospital. The amount of precipitation was determined by weighing. It is quite probable that Mendel already performed parallel measurements in the monastery, some say already from 1857. Mendel's own records of meteorological observations from 1st July 1878 up to July 1883 are archived in the archive of the Brno branch of the Czech Hydrometeorological Institute. An example of very detailed and neatly organized records are shown in Figure 2.

There is not a consensus about this, but based on evidence Mendel moved his observations to the area of the current monastery on Mendel's square. Psychrometer with a barometer was placed on the first floor, where he probably used a metal Stevenson screen for the psychrometer, the extreme thermometers were in the garden next to the bee house and the rain gauge in the so-called "prelate" garden. We could say that Mendel in fact recorded the weather right until his death, because his own hand written records come even from July 1883.

In 2002, a metal Stevenson screen in a very bad condition was found in the depository. At first it seemed more like just some piece of crooked metal. After renovation, however, it became one of the exhibits as a proof of Mendel's meteorological activity (fig. 1). To our great surprise, after careful cleaning we found inside mercury thermometers, which were undamaged and the mercury column very clear, in other words the capillary was not dirty, which is typical for meteorological thermometers used for a longer period of time. These thermometers became even more interesting once we found out that they were manufactured by the Kappeller company, which also manufactured the psychrometer used by Dr. Olexík, and that

they used the Réaumur scale (these days hardly ever used scale introduced by Réaumur in 1730, where the water boiling point was assigned a value of 80°R. The conversion between the Celsius scale can be performed using the equation $t(^{\circ}\text{R}) = 4/5 t(^{\circ}\text{C})$ and $t(^{\circ}\text{C}) = 5/4 t(^{\circ}\text{R})$.

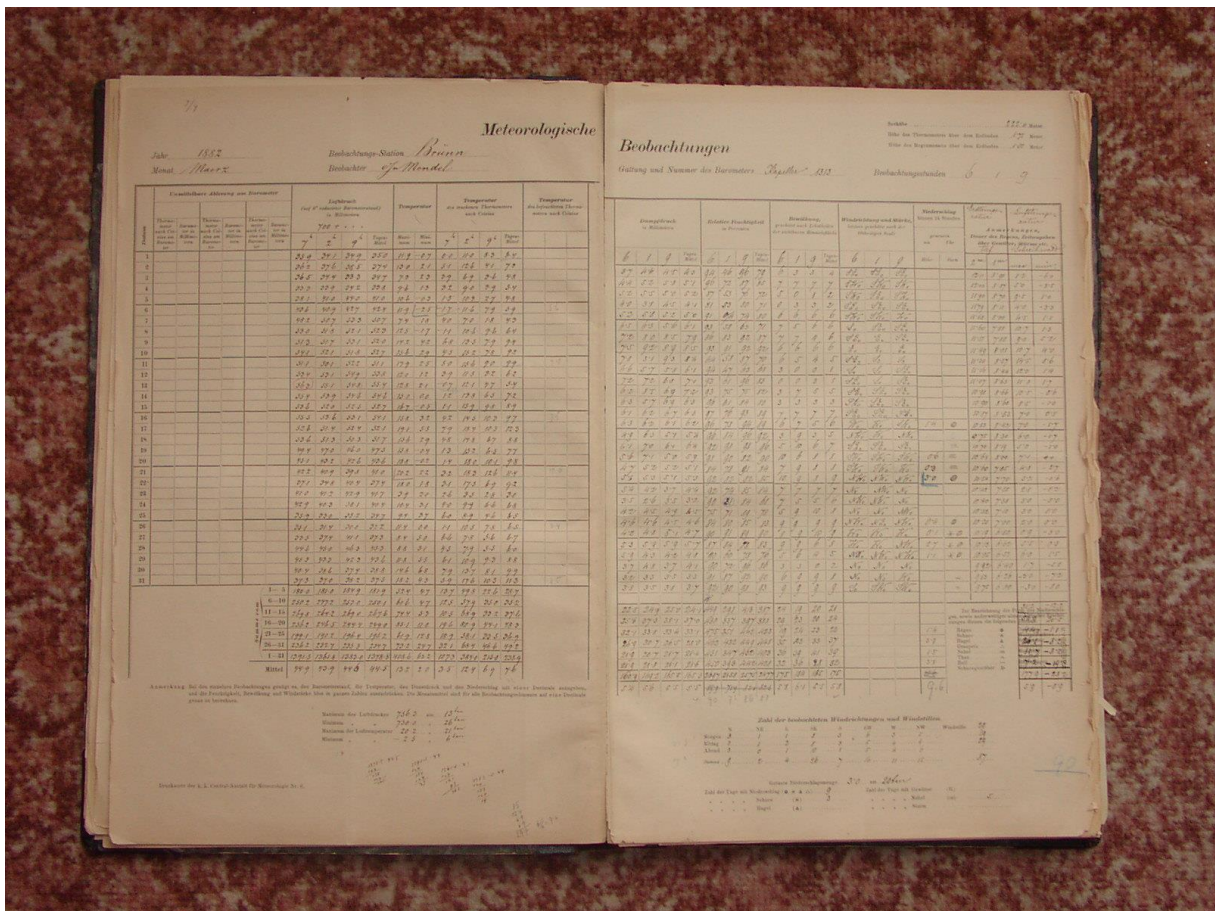


Figure 2 – An example of Mendel’s records of meteorological observations

Although it is not possible to fully prove these thermometers come from Mendel’s measurements, but at least in case of one of them it is highly probable. This is also proved by an expert opinion from a professional technician of the Technical museum in Brno Jaroslav Pipota, who apart from others states, that one of the analyzed thermometers was manufactured by the Kappeller company, based in Vienna, already in 1854. He then estimates that this thermometer comes from the second half of the 19th century (Figure 3).

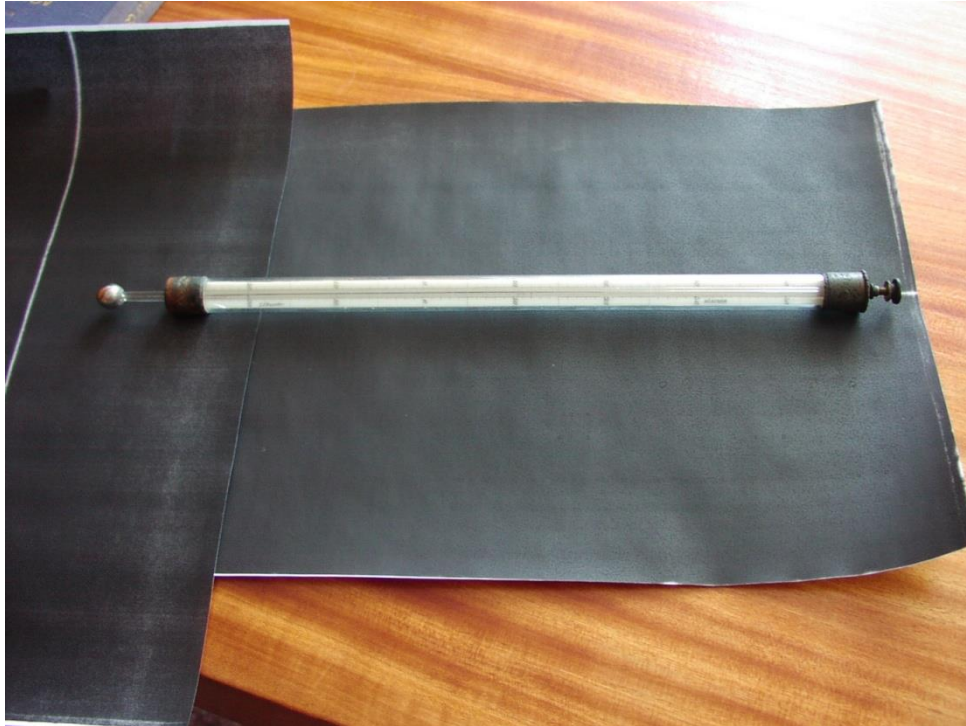


Figure 3 – The original thermometer from the Kappeller Company

Publications

The Brno Nature Society is created on 21st December 1861 and G. Mendel was one of its founders. In this society he has the role of a meteorologist. The section for natural sciences assigned him to perform and analyze meteorological observations in Brno. The results of the analysis of Brno climate were published in 1863 in the form of a graphs and tables under the name *Bemerkungen zu der graphisch-tabellarischen Uebersicht der meteorologischen Verhältnisse von Brünn*. The course of annual air temperature is shown in Figure 2. He also mentions that air temperatures in city centers are higher than those at the suburbs. This fact was only published more than 20 years later by Hann, even though it was in fact Mendel who first proposed the idea of a phenomenon today known as “Urban Heat Island”.

From 1863 he publishes results of processed annual meteorological measurements as *Meteorological observations from Moravia and Silesia for years 1863, 1864, 1865, 1866, 1869 (Meteorologische Beobachtungen aus Mähren und Schlesien für das Jahr 1863 etc.)*. He supported foundation of other meteorological stations and there is evidence that he was also responsible for the creation of several of them in 1865, for example in the cities of Těšín, Hukvaldy, Hranice, Kroměříž etc.

One of significant Mendel's meteorological publications was physically most well worked out publication from 1871 called Die Windhose vom 13th October 1870. Its written publication was preceded by a presentation about a storm, presented by Mendel on 9th November 1870 on a meeting of the Natural Science Society. In his work he evaluates his own findings and also findings of other witnesses who observed the storm. He described the course of this storm, which was unusual not just by the time of the year when it appeared and the location where it appeared, but also the extent of damages it caused. The article gives detailed physical analysis including electrical phenomena and it is proven that Mendel had very good knowledge of meteorological findings of that period. He also mentions the fact that those who considered the storm as a phenomenon of devil have poor knowledge of physics.

When evaluating Mendel's activity, also his support of spreading meteorological forecasts for agriculture is mentioned. Being a wise farmer, Mendel was aware of the importance of weather and climate for agriculture. He therefore fully supported when the Central Institution for Meteorology and Geodynamics in Vienna started issuing short-term weather forecasts on 1st January 1877, which were distributed via telegraph. Subscribers then often passed it further to surrounding towns using simple signalization, for example by hanging baskets or raising flags. Mendel himself tried to produce a 3-day weather forecast, but wasn't very successful. He was aware of the fact that the knowledge back then was insufficient for being able to issue longer forecasts.

He published the results of the analysis of his weather observations in a form of graphs and tables evaluating the Brno climate in 1883. In this work he points out that the temperatures in the city center are higher than those in the city outskirts, today a common phenomenon known as the "urban heat island".

Mendel's activities as a meteorologist supported the spread of meteorological forecasts for farmers. He himself was a wise farmer familiar with the significance of weather and climate for agriculture.

Conclusion

G. J. Mendel is an important figure in the history of Czech meteorology. He was responsible for the expansion of the weather observation network in Moravia. His measurements are part of the Brno series, one of the longest in the region of the

Czech Republic. In the list of his publications, ones about meteorology prevail, which are not just the result of analysis of his measurements, but also works that give detailed description of the physical basis of meteorological phenomena and come with some new findings. It is, however, obvious that these works did not become as significant as his works from the field of biology, in particular genetics.

There is currently a trend towards applying findings from fundamental research in practice and in this context one must not forget Mendel as well. An example of this is his effort towards using weather forecasts by farmers. Looking at Mendel's list of scientific works as a whole, one can see that he was a scientist with exceptionally broad specialization, who was able to analyze individual phenomenon as well as be aware of the natural processes on a global level. At this point it is also necessary to point out his great observational talent, accuracy, diligence and precision, all of which he proved in his meteorological activities.

Appendix A – Chronological overview of significant G. J. Mendel's works

- *Über Verwüstung am Gartenrettig durch Raupen.* Verhandlungen des zoologisch-botanischen Vereins in Wien (Wien), 3, 1853, p. 116 - 118.
- *Bemerkungen zu der graphisch-tabellarischen Übersicht der meteorologischen Verhältnisse von Brünn.* Verhandlungen des naturforschenden Vereines in Brünn (Brno) 1, 1862, Abhandlungen, p. 246-249 – 1 tb. (2).
- *Bemerkungen zu der graphisch-tabellarischen Übersicht der meteorologischen Verhältnisse von Brünn.* Brünn, typ. Gastl 1862, 4 p., tb.
- Jahresberichte pro 1862 des naturforschenden Vereines in Brünn (Brno), 1, 1862.
- *Meteorologische Beobachtungen aus Mähren und Schlesien für das Jahr 1863.*
- Verhandlungen des naturforschenden Vereines in Brünn (Brno), 2, 1863, Abhandlungen, p. 99-121.
- *Meteorologische Beobachtungen aus Mähren und Schlesien für das Jahr 1864.* (Vorgelegt in der Sitzung vom 8. März 1865.)
- Verhandlungen des naturforschenden Vereines in Brünn(Brno), 3, 1864, Abhandlungen, p. 209-220.

- *Versuche über Pflanzen-Hybriden*. (Vorgelegt in den Sitzungen vom 8. Februar und 8. März 1865.) Verhandlungen des naturforschenden Vereines in Brünn (Brno), 4, 1865, Abhandlungen, p. 3-47.
- Verhandlungen des naturforschenden Vereines in Brünn (Brno), 4, 1865.
- *Versuche über Pflanzenhybriden*. Brünn, typ. Gastl 1866. 47 p.

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Summary

G. J. Mendel se významně zapsal do dějin české meteorologie. Zasloužil se o rozšíření sítě meteorologických pozorování na Moravě. Jeho měření jsou součástí brněnské řady, jedné z nejdelších na území České republiky. V jeho publikační činnosti počtem převládají práce meteorologické, které nejsou jen výsledkem zpracování naměřených údajů, ale také práce s podrobnou analýzou fyzikální podstaty meteorologických jevů, přinášející nové poznatky. Jisté však je, že tyto práce nedosáhly významu prací biologických, či přesněji řečeno genetických. Jestliže dnes hovoříme o potřebě co nejvíce využívat poznatků základního výzkumu, musíme tento pohled zdůraznit u G. J. Mendela. Dokladem je jeho snaha o využití předpovědi počasí pro zemědělce. Vezmeme-li v úvahu celé vědecké dílo G. J. Mendela, vidíme, že šlo o vědce s mimořádně širokým zaměřením, který dokázal analyzovat dílčí jevy, ale současně je vnímal v celkovém komplexu přírodních procesů. Zde jen nutně zdůraznit též jeho vynikající pozorovatelský talent, přesnost v práci, píli a pečlivost, toto vše uplatnil i ve své meteorologické činnosti.

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