

# GREGOR MENDEL — AS A PERSON AND AS A DISCOVERER

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GREGOR MENDEL (1884):

Even though I have had to go through a number of bitter times in my life, I must thankfully own, that the nice and good times have predominated. My experimental work brought me a great deal of satisfaction and I am convinced that it will not be long before the whole world will acknowledge it.

In February and March 1865 Gregor Mendel made public the results of his experiments in Brno. At that time nobody understood the genius of the modest member of the Augustinian Monastery in Brno and when he was buried in 1884 nobody even remembered his scientific activity. This year the centenary of the publications of Mendel's discoveries is celebrated in all cultural countries of the world. Mendel is remembered as the discoverer of the principles of heredity, which is of the same importance for biology as the Newton principle of gravitation for physics.

Mendel's work was neglected 100 years ago, but in the 20<sup>th</sup> century, genetics, the science which developed from it, has penetrated into all branches of biology, has become the "Core Science of Biology" and is leading to the explanation of the greatest mystery of life — its substance, origin and evolution.

In August 1965 the Czechoslovak Academy of Sciences is organising a Mendel Memorial Symposium in Brno and the Gregor Mendel Genetic Department of the Moravian Museum will open the newly erected Gregor Mendel Memorial Hall in the building of the former Augustinian Monastery, where Mendel lived and carried out his experiments.

The development of biology in the last 100 years, especially during the "explosion" era of biological discoveries after the Second World War, fully confirms the validity of Mendel's principles. A discovery of such great significance appears only very seldom in the development of science, and that is why the biologists and at the present time also physicists and chemists pose themselves questions as to what lead Mendel to his discovery and under what conditions he grew up and worked. It is difficult to imagine that these questions will ever be fully answered. On the basis of the study of Mendel's work we can come to the conclusion that some extraordinarily inventive idea was born in his brain which threw light on the greatest mystery of life — on heredity.

The creative growth of Mendel's genius was undoubtedly influenced by the family atmosphere where Mendel grew up and the atmosphere of the Monastery in Brno where he could fully develop his creative and experimental ability and slowly



Portrait of Mendel from the time he carried out his experiments (known as the professor portrait).

realise his extensive programme of experimental research work and analyse the results of each experiment in peace and quiet.

Gregor Johan Mendel was born on July 22, 1822, at a small village Hynčice in the north Moravia, the former Austrian Silesia. His father being a small peasant-farmer, had to work hard 3 days a week for the nobility in the era of serfdom. Even under these hard conditions he was able to build up a prosperous small farm. The farm buildings were surrounded by a large garden, where Mendel's father kept the most fertile kinds of fruit trees. He was surely very hard-working and painstaking and



Mendel in the group of teachers at „Oberrealschule“ in Brno.

under modest conditions showed his creative spirit and tenacity in building up the farm. Mendel's mother was a fine modest woman. Her uncle A. Schwirtlich was an outstanding personality at Hynčice. He was the first teacher at Hynčice as an autodidact and was outstanding in his knowledge and pedagogic talent.

Little Johann was already a prominent pupil at the Elementary school at Hynčice and the teacher Makitta, supported by Johann's mother succeeded in persuading his father to let him study even though he was the only son of a farmer. Already at that time small Johann showed his desire for education and he himself begged his parents to let him study. This great desire for studying connected with an enormous perseverance remained with him all through his life. We can say he was reserved, assiduous and stubborn like his father and from his mother's side he inherited his sensitiveness, high intelligence and pedagogical talent. From his parents, his native country and village, he acquired his love for nature and his interest in the plant and animal kingdoms.

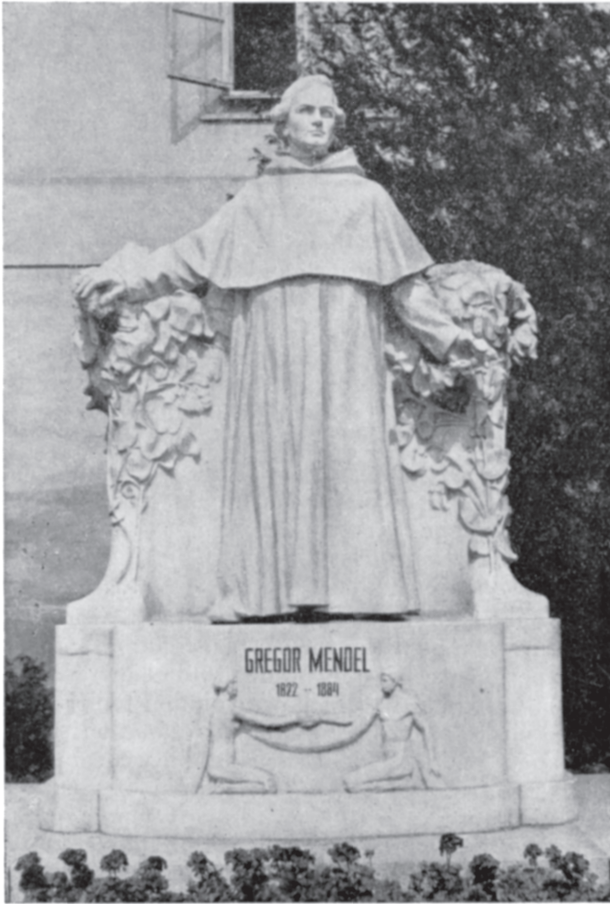
Mendel passed through the Secondary School with excellent results. In 1838, in the fifth year of these studies, his father was seriously injured and, not being able to work any longer, was unable to continue to support his son's studies. He handed

over his farm to Mendel's elder sister Veronika who married a farmer named Sturm.

Mendel himself later wrote the following about this situation in his autobiography, using the third person: "... due to several successive disasters, his parents were completely unable to meet the expenses necessary to continue his studies, and it therefore happened that the respectfully undersigned, then only sixteen years old, was in the sad position of having to provide entirely for himself. For this reason, he attended the course for "School Candidates (Applicants) and Private Teachers" at the district Teacher's Seminary at Opava. At that time he was very much afraid about his future and this psychologic tension resulted in a serious illness, so that he had to interrupt his studying for a short time. Being highly recommended in his examination report he succeeded in earning a scanty livelihood by private tutoring during his studies of the humanities.

When he graduated from the Gymnasium in the year 1840, his first care was to secure for himself the necessary means for the continuation of his studies at the Philosophical Institute at Olomouc. Because of this, he made repeated attempts to offer his services as a private teacher, but all his efforts remained unsuccessful because of lack of friends and recommendations. The sorrow over these dis-





The Mendel Monument in the garden of the former Monastery in Old Brno.

appointed hopes and the anxious, sad outlook which the future offered him, affected him so powerfully at that time, that he felt sick and was compelled to spend a year with his parents to recover.

In the following year the respectfully undersigned found himself finally placed in the desired position of being able to satisfy at least his most necessary wants by private teaching at Olomouc, and thus to continue his studies. By a mighty effort, he succeeded in completing the two years of philosophy.

The respectfully undersigned realized that it was impossible for him to endure such exertions any further. Therefore, after having finished his philosophical studies, he felt himself compelled to step into a station of life, which could free him from the bitter struggle for existence."

At that time, so critical for Mendel, F. F r a n z, professor of mathematics, offered him the possibility of entering the Augustinian Monastery in Old Brno and thus of further studying. "His circumstances decided his vocational choice. He requested and received in the year 1843 admission to the Augustinian Monastery St. Thomas in Old Brno."

In the Cloister, however, he found a favourable atmosphere for the mansided development of his talent and the opportunity of developing his interest in natural science thanks to the tolerant broad-minding Abbot of the Monastery C. N a p p.

Abbot N a p p was an outstanding cultural personality in Brno and he accepted into the Monastery only gifted men for whom he provided opportunities and conditions for further education and scientific growth in many fields. The Old Brno Monastery became an important cultural centre of Brno and of the whole Moravia.

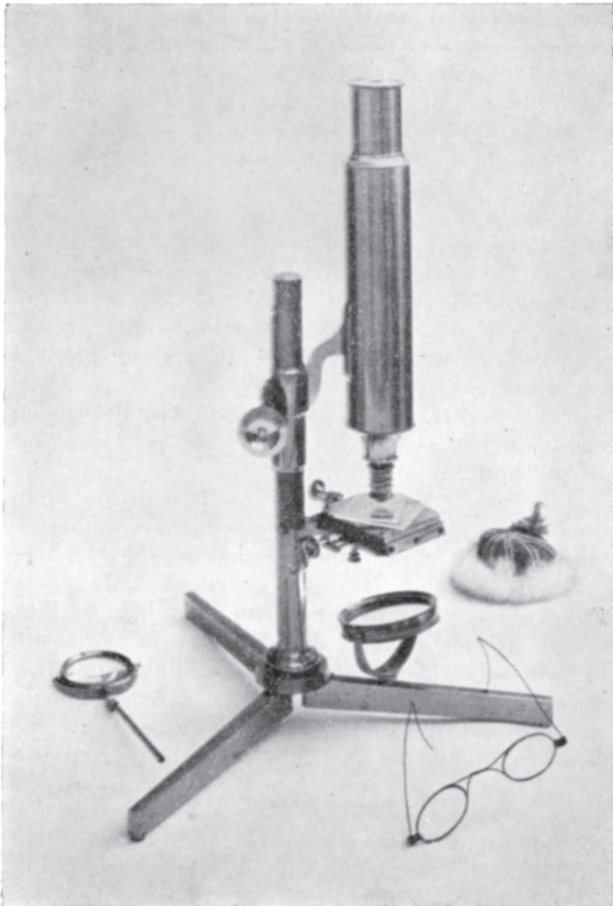
Among the brethren M e n d e l found a suitable atmosphere he might have been satisfied with. From that time he writes about himself: "With the comfortableness of his physical existence, so beneficial to any kind of study, the respectfully undersigned regained his courage and strength and he studied the classical objects prescribed for the year."

He was surrounded by brethren who possessed great knowledge from natural science, which influenced and supported his interest in this line. "In the spare hours, he occupied himself with the small botanic-mineralogical collection which was placed at his disposal in the Monastery. His special liking for the field of natural science deepened the more he had the opportunity to become familiar with it. Despite his lack of any oral guidance in these studies, plus the fact that the auto-didactic method here, as perhaps in no other science, is extremely difficult and leads to the goal only slowly, he became so attached to the study of nature from this time on that he will not spare any effort to fill the gaps that are still present through self-instruction and the advice of experienced men. In the year 1846, he also attended courses in agriculture, pomiculture, and wine-growing at the Philosophical Institute in Brno." This shows his great desire to devote himself to natural science.

"In the following year at the time when he was about to undergo his examination, he was asked to accept the position of a substitute teacher at the Gymnasium at Znojmo, and he followed this call with pleasure. From the beginning of his substitute teaching, he made all efforts to present his assigned subjects to the students in an easily comprehensible manner. He hopes his endeavour was not quite without success since, during that private tutoring to which he owed his bread for four years, he found sufficient opportunity to collect experiences regarding the possible accomplishments of the students and the different grades of their mental capacity."

Obviously at that time he wished to attain the rank of teacher, so as to insure his existence by teaching. He himself characterized it once again in his autobiography: "His sorrowful youth taught him early the serious aspects of life, and taught him also to work. Even while he enjoyed the fruits of a secure economic position, the wish remained alive within him to be permitted to earn his living. The respectfully undersigned would consider himself happy if he could conform with the expectations of the praiseworthy Board of Examiners and gain the fulfilment of his wish. He would certainly then shun no effort and sacrifice to comply with his duties most punctually."

At the examinations M e n d e l was unsuccessful, probably because after all he lacked a complete



One of the Mendel's microscopes with his glasses.

university education. But this did not discourage him from further efforts. It also did not lose for him the support of his superior. Abbot N a p p sent him to Vienna for two years to study natural science properly and regularly. He attended the lectures on experimental physics (given by prominent Professor D o p p l e r), on zoology, botany, on general pharmaceutical, analytical and organical chemistry, on anatomy of plants, palaeontology, and microscopical technics. At that time M e n d e l was especially interested in the exact sciences of mathematics and physics.

He returned to Brno from his university studies with the idea of realizing an extensive programme of research, by which — as he himself states later in the introduction to his classic work "... we can finally reach the solution of a question the importance of which cannot be overlooked in connection with the history of the evolution of organic forms".

During the next 10 years he was working in Brno as a teacher of physics and natural science and carried out his experiments with the crossing of plants with great industry and concentration. In February and March of the year 1865 he made public, in two lectures at meetings of the Natural Science Society, the results of his now famous discoveries of the principles of heredity. He knew that his work was unusual and quite new for the

biology of that time, which is proved by the following sentence from his second letter to N ä g e l i in April 1867: "I knew that the results I obtained were not easily compatible with our contemporary scientific knowledge, and that under the circumstances publication of one such isolated experiment was doubly dangerous; dangerous for the experimenter and for the cause he represented."

He was convinced, that the results of his work were of general significance and asked, in his paper, for his experiments to be checked and in this way he expected his results to be confirmed. Even in his letter to N ä g e l i we may read: "I encountered, as was to be expected, divided opinion; however, as far as I know, no one undertook to repeat the experiments."

He was also quite sure about his explanation of the results of his experiments. In his second letter to N ä g e l i he mentioned: "Up to this point I don't believe I can be accused of having left the realm of experimentation."

M e n d e l also studied Darwin's work in detail. He accepted the theory of evolution and by his experiments he only wanted to show a new and better explanation of how evolution took place, which can be proved by numerous quotations from his papers and letters. In his library we can find the German translation of "The Origin of Species" issued in Stuttgart in 1863 with many marks, especially of those portions, dealing with the crossing of plants and animals. E. g. on the first page of the "Introduction" in the upper corner, we can find in Mendel's own handwriting the note "pag 302". On this page we can see the following text margined by two lines: "The slight variability of hybrides in the first generation, in contrast with that in the succeeding generations, is a curious fact and deserves attention."

"The curious fact" of the slight variability in the first generations and the great variability in the succeeding ones were quite clear to M e n d e l and this is why he margined it.

The biologists of that time were enthusiastic about Darwin's theory of evolution and no one took any notice of the work by the unknown scientist M e n d e l from Brno.

He was dissatisfied that nobody understood and acknowledged his work. The failure of N ä g e l i to appreciate the value of Mendel's work undoubtedly had an influence on discouraging him from further research work.

On the recommendation of N ä g e l i M e n d e l carried out his further experiments with the crossing of Hieracium, the results of which he also made public in the Natural Science Society in Brno and later in 1869 published in "Verhandlungen" of this Society. The results according to Mendel were "still very uncertain compared with those obtained by crosses made between forms of Pisum" and "In Hieracium according to the present experiments the exactly opposite phenomenon seems to be exhibited." M e n d e l could not understand why he obtained the opposite results with Hieracium, be-



cause it was not until some years later that the apogamic character of this plant was discovered.

It must have been very difficult and entiring work, and in the year 1869 his sight became impaired. In the letter to Nägeli of April 15, 1869 he wrote: "I have been master of my own time for only a few days now, and in a position to resume my favourite occupation, which I had to discontinue about the end of June of last year, because of an eye ailment." This letter testifies, that the experimental work in the garden was still Mendel's favourite work.

In 1868 Mendel was elected Abbot of the Monastery and from that time on, he could devote himself less and less to his experimental work. Even later in the function of Abbot of the Monastery Mendel never lost his love for nature. He was very busy with his functions and in his tenth letter to Nägeli of November 18, 1873 he wrote: "I am really unhappy about having to neglect my plants and my bees so completely."

During the whole time nearly up till his death he carried out hybridizing experiments on fruit trees and various garden plants in the garden of the Monastery. He even made experiments with bees, which were simpler to those carried out with peas. The data from all these activities were unhappily destroyed and thus unknown to us. Mendel also devoted himself to meteorology. He wrote about himself as a "teacher of experimental physics". He kept meteorological records for the Central Meteorological Institute in Vienna and used to publish the results of his meteorological observations.

Towards the close of his life Mendel did not

like to speak about his pea experiments and only exceptionally he remarked "it will not be long and my work will be recognised".

It was not till the knowledge of the cell as a unit of living matter, and especially of the cell-nucleus with chromosomes, had developed to such an extent that, in the year 1900, the work of Mendel was rediscovered. Since that time Mendel's work has been held up as an example of the application of scientific method even in modern experimental science.

At the present time we are commemorating and celebrating the Centenary of Mendel's discoveries and we bow before the genius of this modest hard-working biologist, the member of the Augustinian Monastery in Brno, who is known all over the world as the "Father of Genetics".

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