Gregor Mendel.
Um das Jahr 1862.

Mendel and the Agricultural Society of Brno

Excerpts from *Gregor Mendel—the First Geneticist* by Vitezslav Orel (1996)

Gregor Mendel (1822-1884) is often portrayed as an obscure monk working quietly in a monastery garden somewhere in the backwaters of Europe. But was Mendel's discovery of the mechanism of inheritance really an isolated incident far removed from the rest of science in the nineteenth century? In answering this question we must understand that science advances by the accumulation of knowledge. Was Mendel's discovery an exception to the cumulative nature of science? Sir Isaac Newton famously observed that he was able to see so far because he stood on the shoulders of the giants that had come before him. On whose shoulders did Mendel stand?

Mendel lived and worked most of his life in the city of Brno, located 110 kilometers (70 miles) north of Vienna, then capital of the Austrian Empire, now the capital of Austria. Today Brno is located in the Czech Republic. At the start of the nineteenth century, Brno, which was then capital of the province of Moravia, became the

center of the textile industry of the Hapsburg monarchy. With an eye to improving wool production through scientific breeding, those who were concerned with textile development promoted the natural sciences by organizing learned societies. In 1806, the Moravian Society for the Improvement of Agriculture, Natural Science, and Knowledge of the Country (henceforth referred to as the Agricultural Society) was inaugurated. The accomplished naturalist Christian Carl Andre was one of its foremost figures, and in 1815, drew up a program of scientific development for the Society that emphasized the importance of developing basic and applied research in the natural sciences. From this progressive beginning the Agricultural Society continued to promote the scientific study of plant and animal breeding during the following decades.

Parallel to these developments, Emperor Franz I in 1807, ordered that the members of the Brno Augustinian monastery take on the teaching of mathematics and biblical studies in the newly established Philosophy Institute. C. F. Napp, Mendel's predecessor as abbot of the Brno monastery, accepted with enthusiasm the imperial directive for the monastery to prepare its monks for the teaching profession: the interpretation he put upon it was that they should assist in spreading the word on the latest scientific findings. Abbot Napp was also an influential member of the committee of the Agricultural Society and President of the local Pomological (fruit and wine growers) Association.

In 1849, Mendel was sent by Abbot Napp to the University of Vienna to study science in preparation for teaching. Specifically, Napp sent Mendel to study exact physics at the newly established institute headed by Professor Christian Doppler, discoverer of the Doppler effect. Before coming to Vienna Doppler had taught mathematics and the second edition of his arithmetic and algebra textbook was published during Mendel's studies in Vienna. In it Doppler outlined the principles of combinatorial theory and the theory of probability in relation to the needs of applied science. Later Mendel was able to put these principles to good use in his research on plant hybridization. Doppler's teaching methods of experimental research and of the manner of solving scientific problems were also of great use to Mendel.

In addition to Doppler's influence, a book which may have been of major importance to Mendel was that published by the Viennese astronomer L.L. Littrow, who informed his readers of the probability theory developed by his fellow astronomer P. S. de Laplace (1749-1827) and fellow mathematician J.F.K. Gauss (1777-1827). According to Littrow: "All phenomena, even those which seem most dependent on pure chance, exhibit, when they are repeated often enough, a tendency to more and more constant relations, and are subject to some usually very simple law."

In addition to physics Mendel also signed on for additional lectures in mathematics, chemistry, zoology, botany, the physiology of plants, and paleontology. Plant physiology was a new subject at the University of Vienna and was taught by F.

Unger (1800-1870). Unger's scientific orientation was significantly influenced by J.M. Schleiden (1804-1881), who is associated with the development of the cell theory in plants. In his most outstanding work, *Principles of Scientific Botany*, Schleiden stated that he was above all offering a guide to the new manner of researching into plants. Schleiden's masterpiece was bought by Mendel, and it can be assumed that he read the methodological part of it. His research was conducted in accordance with Schleiden's maxims. Unger had a tremendous influence on Mendel. In addition to introducing Mendel to the work of Schleiden, his writings on the hybridization of plants also drew attention to the use of the artificial pollination of plants to create new varieties. Unger's lectures aroused the interest of his students not only in study, but also in experimentation.

Mendel finished his university studies in 1853, and in 1854, Professor Zawadski of the Brno *Realschule* (equivalent to a modern technical high school) proposed to the Natural Science Section of the Agricultural Society that his young colleague, the new physics teacher at the *Realschule*, Friar Gregor Mendel, should be confirmed as a full member. Professor Zawadski nurtured his students' interest in the natural sciences at the *Realschule*, and in the learned societies he belonged to he encouraged members to perform research. In the year Mendel was inducted into the Agricultural Society, Zawadski had given a series of three lectures to the Society on the enigma of procreation, which must have fascinated Mendel, since he had attended Professor Unger's lectures on the same topic, and it was closely connected with the subject of his own research.

In 1859, a new society was formed from the Natural Science Section of the Agricultural Society. The Natural Science Society was formed to devote its members to "pure science" as opposed to applied. Mendel was one of the 142 founding members. In 1865, Mendel presented a paper to the Natural Science Society entitled *Experiments in Plant-Hybridization*, and with it the modern science of genetics began.

Why was Mendel so far ahead of his time, i.e. with his application of reductionism and statistics to biology? Mendel is one of the first examples, if not the first, of a scientist trained in the physical sciences that went on to make major contributions to biology. Fisher, Haldane, Sewall Wright, Max Delbruk, and John Maynard Smith are later examples of this tradition. And common to all is their skill in mathematics and commitment to the reductionist program. Mendel, because of his training, was simply fifty years ahead of his contemporaries in biology, almost all of whom were innumerate.

Reference

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Web References

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